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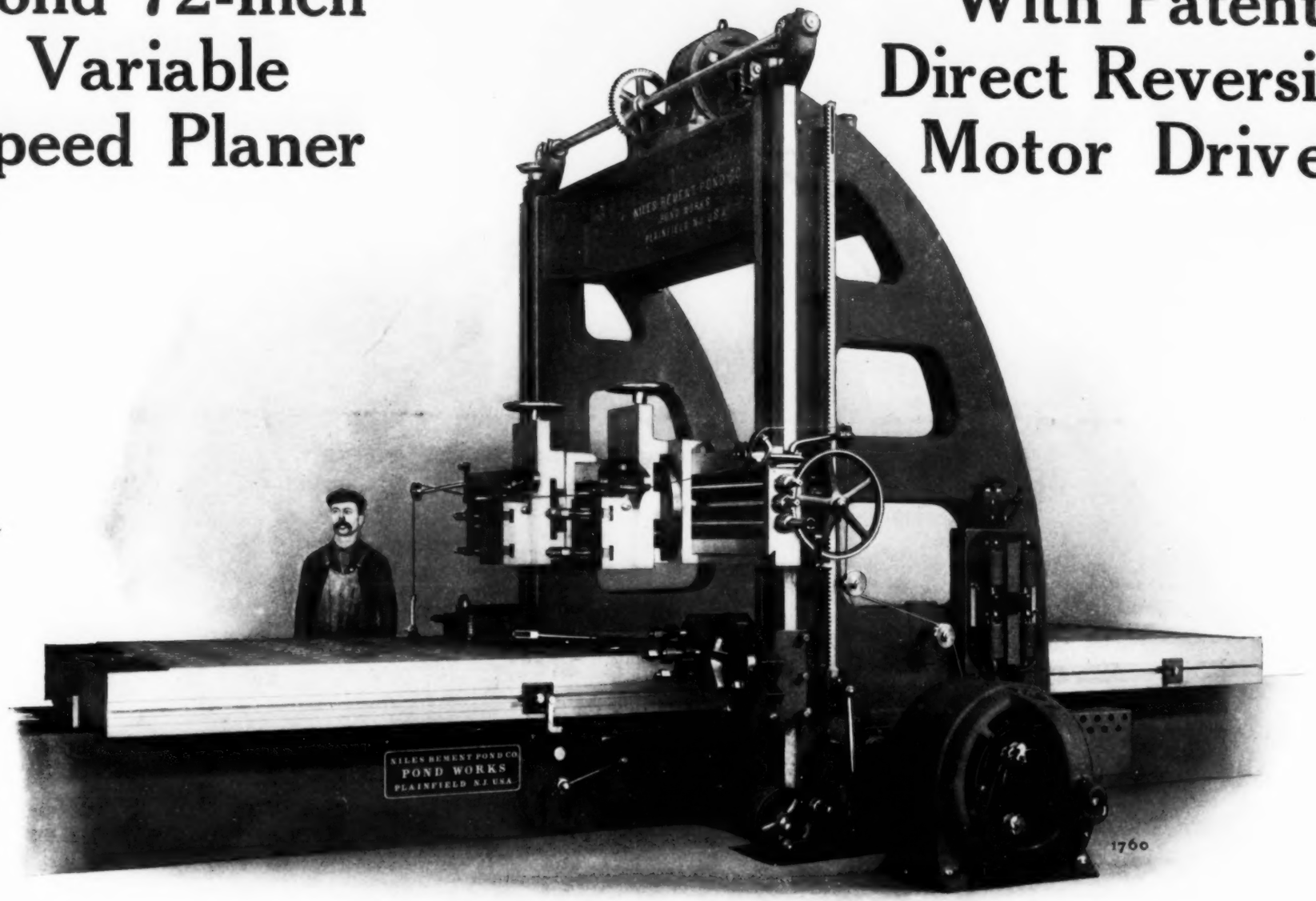


# Making the Atlas Motor Car

By Snowden B. Redfield

*A motor which is built up in units, using a sectional crank shaft that requires good tools and careful work. This includes careful boring, keying and alining and makes interesting work.*

In the construction of the Atlas Motor Car, manufactured in Springfield, Mass., there is included a crank shaft of rather remarkable characteristics. The Atlas car is of the two-cycle gasolene type and the construction of the shaft is such that most of the clearance space in the crank case is occupied by the crank disks, and as the process of taking down the shaft is to remove its various elements consecutively, in a lengthwise direction, it is unnecessary to provide split bearings at the ends of the crank case. By thus filling up the crank-case volume, the pumping action of the crank case, as is usual with two-cycle engines, is increased in efficiency and by the elimination of the split bearings a much tighter compression space is provided.

Fig. 1 illustrates one of these crank shafts, which are composed of 17 main elements, and the illustration shows the method of testing for alinement after assembling. It will be seen that there is a Bath indicator at *A*, which, although turned up so as to show in the halftone, will indicate any deflection of the central element of the shaft, when the latter is rotated on the centers. In the case of the particular shaft illustrated, the total deflection of the bath indicator when the shaft was thus rotated, was not more than 0.001 inch total, or a deflection of half a thousandth in either direction. When the large number of parts involved in the shaft are considered, it will be agreed that this is rather accurate work.

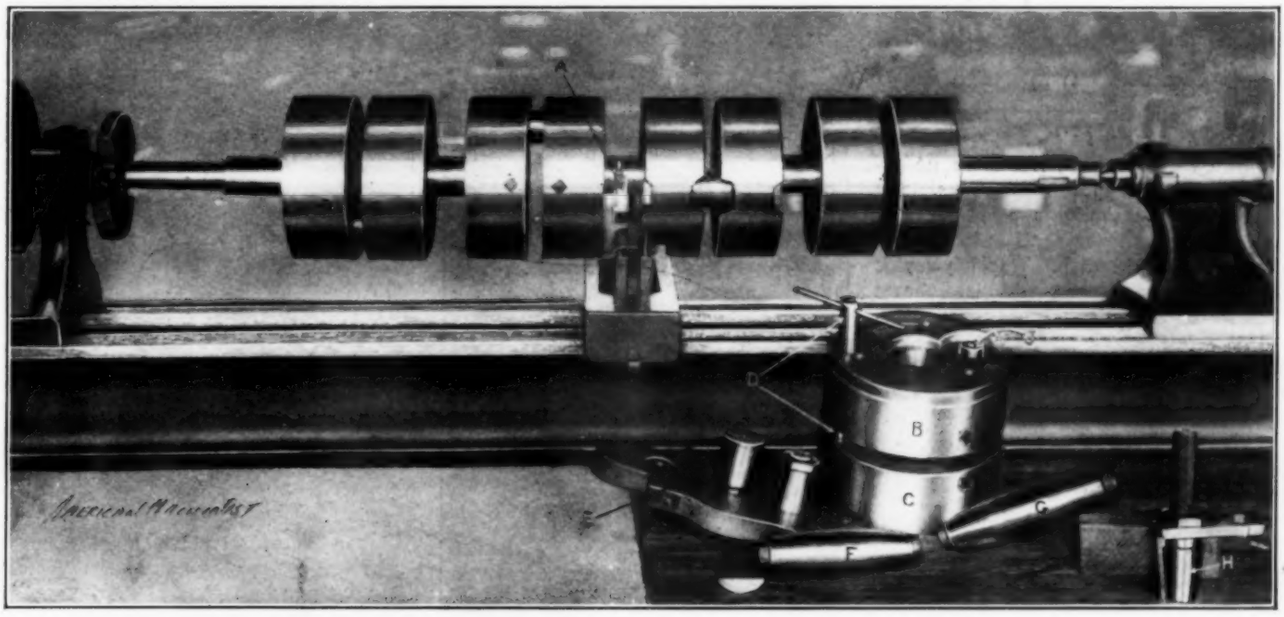



FIG. 1. TESTING CRANK SHAFT OF 17 ELEMENTS WITH BATH GAGE AT CENTER

Fach of the shaft elements and crank pins form taper bearings in the crank disks, being held tightly by nuts and keys. In taking down the engine, the procedure is to take off the one end plate of the crank case, remove the nut from the end of the first crank pin, pull out the first section of shaft with the first disk; then remove the nut on the next shaft element and pull off the second disk with the first pin, following this by taking off the first complete section of the crank case, which is formed in sections, one for each crank, or engine cylinders; so continuing until the entire engine is dismantled. When all the parts are clean, the shaft may again be assembled by the reverse process, alinement being secured by the tapered joints and keys and the extreme accuracy of the machine work.

### BORING AND REAMING THE DISKS

As may be supposed, the process of manufacturing these shafts in an economical manner is unusually interesting. The disks themselves are of semisteel, cast hollow, with suitable counterweights, and plugged so as to effectively occupy the clearance space in the crank case. After being turned and faced, each disk is held in a chuck as in Fig. 2, on a Jones & Lamson turret lathe and the central taper hole for the crank-shaft element roughly reamed out by the roughing reamer shown. This is followed by the guided taper, finishing reamer, also shown in the same illustration, the pilot of which is guided by a bushing held in the spindle of the lathe.

Following this, the crank disk is held on a special face plate, as shown in Fig. 3, so that the crank-pin hole comes on the center line. The location of the disk center is secured by a taper bushing just over a stud in the face plate, and by a pin also located in the face plate and fitting a hole drilled in the disk, directly opposite the crank-pin hole. This latter pin prevents the disk from turning on its own axis around the taper bushing and stud, and brings the crank-pin hole in exactly the same position for all disks. The counterweight shown in the illustration balances the weight of the disk as it turns. In this fixture the crank-pin hole is only rough reamed. The finish reamer shown is that used as in Fig. 2 for reaming out the main shaft hole and takes no part in the machining of the crank-pin hole.

After the crank-pin hole is rough reamed, the disk is put in the fixture shown in Fig. 4 and accurately bored to the correct taper. In this fixture also, a taper bushing, one of which is shown at *A* in Fig. 4, fits into the shaft hole in the disk and over a stud in the face plate, while a second stud or pin, as before, projects from the faceplate into the hole drilled in the back of the disk, directly opposite the crank-pin hole, thus locating the latter on the axis of the lathe.

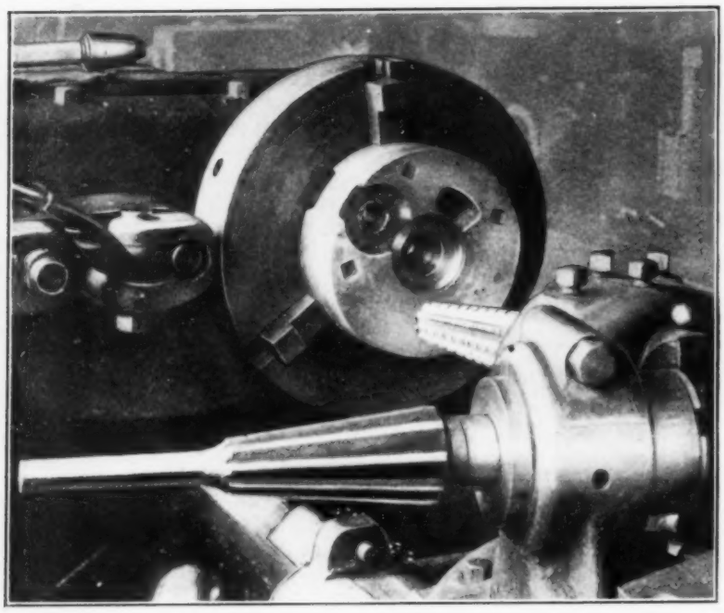


FIG. 2. REAMING TAPER HOLE IN DISK FOR CRANK SHAFT

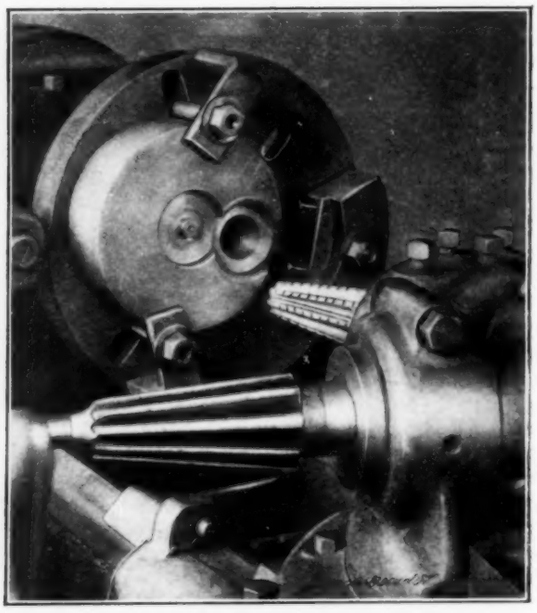


FIG. 3. ROUGH REAMING TAPER HOLE FOR CRANK PIN

In this fixture the crank-pin hole is finished by boring, emphasizing the fact that a more accurate taper hole may be secured in this way than by reaming.

### CUTTING A KEYWAY IN THE TAPER

When both the shaft and crank-pin holes have been finished to their respective tapers, which, it will be understood, face in opposite directions, it is necessary to cut the keyway for the shaft element in the taper shaft hole through the center of the disk. This keyway is cut on the keyseating machine shown in Fig. 5, with the fixture there illustrated. On the table of the machine there is a wedge-shaped block, the angle of which is such that the vertical motion of the cutter bar and tool will cut the keyway parallel to the taper of the shaft hole in the disk. On the fixture there is a taper plug *A*, which fits over a stud at right angles to the wedge surface of the block. This taper plug is forced upward by a spring and fits into the taper crank-pin hole of the disk, while the short parallel pin *B* projects into the hole *C*, drilled into the back of the crank disk, which is the same hole already spoken of in connection with the fixtures for reaming and boring the crank-pin hole in the lathe.

### ALINING THE DISKS AND KEYING THE CRANK PINS

It will be appreciated that when a crank pin is inserted into two disks, forming a crank, it is necessary that these two disks shall be directly in line with each other, so that the two shaft elements will be in line. Referring back to Fig. 1, the disks *B* and *C* are held together by the crank pin *J*, upon which the locking nut has not yet been placed. This crank pin fits the taper holes in the two disks, the double-ended taper pin being shown at *F* in Fig. 1. Previous to being thus assembled, the drilling jig *E*, Fig. 1, is used to redrill the hole shown at *C* in Fig. 5. This original hole *C* did not extend completely through the disk, as it is at first necessary only to make it deep enough to take the pin in the faceplate fixtures to

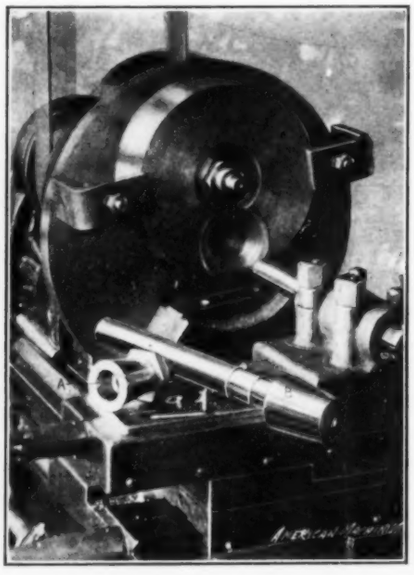


FIG. 4. FINISH BORING TAPER HOLE FOR CRANK PIN

properly locate the crank-pin hole. Even though the crank-pin hole was bored with reference to the drilled hole *C*, to make assurance doubly sure, the process is next reversed, and the hole *C* is redrilled completely through, in exact line with the crank-pin hole and the hole for the main shaft in each disk. To secure this, the drilling jig *E* is placed upon the disk, with the two taper plugs fitting, one into the shaft hole and the other into the crank-pin hole and the drill guided by the bushing at the left end.

With the holes accurately drilled, the line pin *G* is put through, which, when the crank pin *J* is in place, must necessarily bring the main-shaft elements in the centers of the two disks, directly opposite each other. In Fig. 1, *G* represents a short section of the shaft which goes between two cranks, and a Woodruff key is shown on the left-hand taper end. It is this key which fits into the keyway cut on the fixture shown in Fig. 5. The gage *H*, Fig. 1, is for testing the alinement of the keyways in the disks. The upper end of the crank pin *J* must project through the hole in the overhanging arm of *H*, while the key fits into the keyway and the taper plug fits the taper shaft hole.

### KEYING THE DISKS

When the exact alinement of the two disks *B* and *C* as shown in Fig. 1 has thus been secured by means of the lining pin *G*, it is necessary to key the two disks to the two ends of the crank pin. This operation is shown in Fig. 6. Here, although the line pin has been withdrawn, the two disks are still exactly in line, having been forced down tightly over the tapers of the crank pins. Here, again is a wedge-shaped block, on the table of the drill press, to give the correct slant, so that the drilling will be parallel to the taper of the crank-pin end. The drilling jig shown at the left, on the table of the drill press, is put on top of the upper disk with the taper plug extending into the shaft hole, and the bushed hole in the jig fitting over the upper threaded end of the crank pin. A suitable drilling bushing is provided so that the drill is guided down the taper of the joint between the

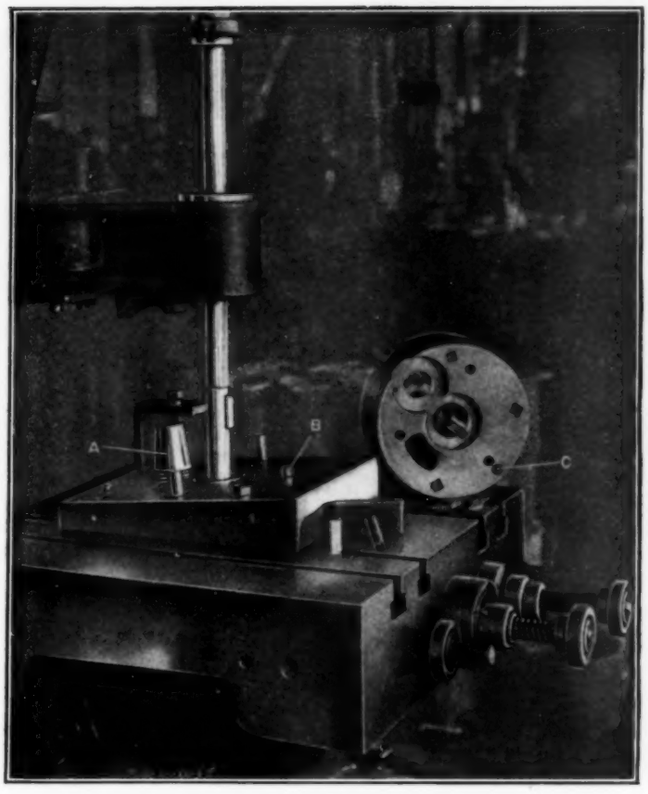



FIG. 5. FIXTURE FOR CUTTING KEYWAY IN TAPER CRANK-SHAFT HOLE

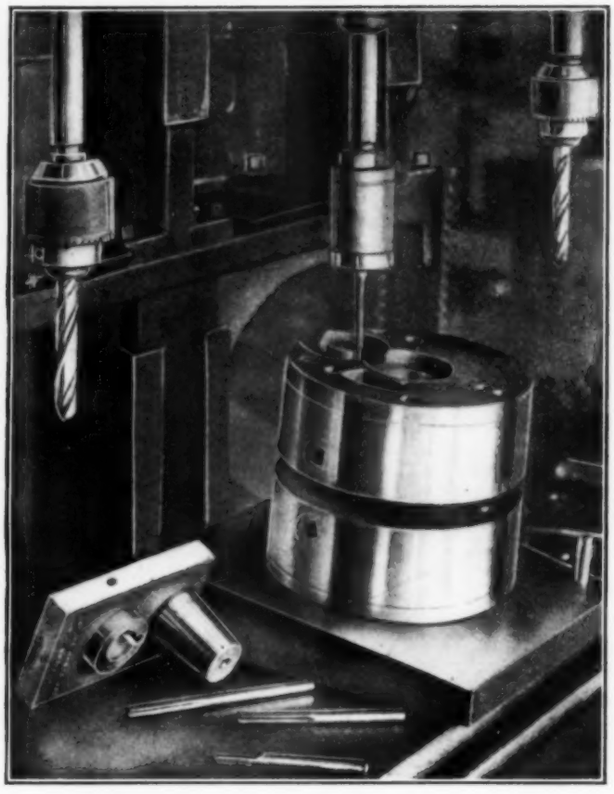


FIG. 6. DRILLING FOR THE KEY PIN IN TAPER CRANK-PIN HOLE

pin and the disk, being half in the disk and half in the pin. In this work D-drills are used, and the hole is started with a drill slightly under sized. After starting, the drilling is completed with a body-size drill of the same character, this being followed by reaming. When this hole has been drilled and reamed in each disk and the respective ends of the crank pin, a key pin is inserted to hold all parts exactly in line.

Of course, the shaft elements and crank pins are turned, this work being done in Jones & Lamson turret lathes, and they are afterward ground on Brown & Sharpe grinders. With these methods, these shafts are manufactured with a limit of inaccuracy of 0.002 inch at the center, when tested with a Bath indicator, as shown in Fig. 1.

### DIFFERENTIAL HOUSING

Fig. 7 shows the boring of the bearings in the differential housing, this work

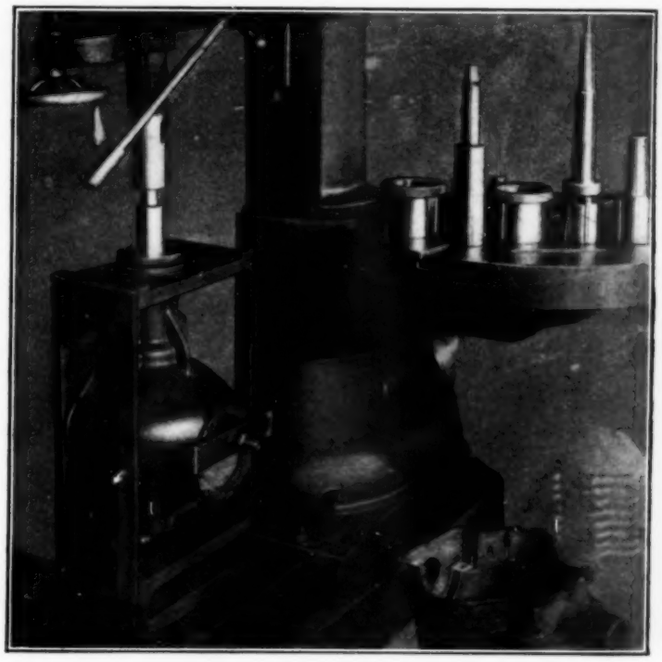


FIG. 7. BORING SHAFT BEARINGS IN DIFFERENTIAL BOX

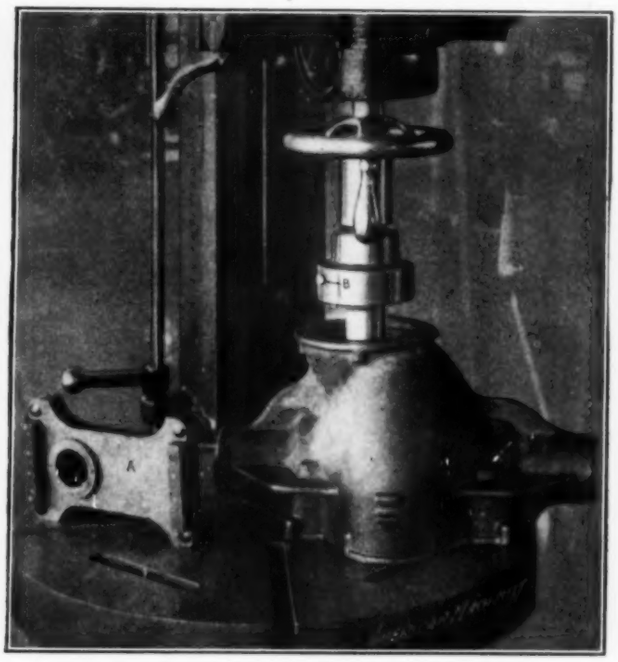



FIG. 8. BORING DRIVE-SHAFT OPENING IN DIFFERENTIAL BOX

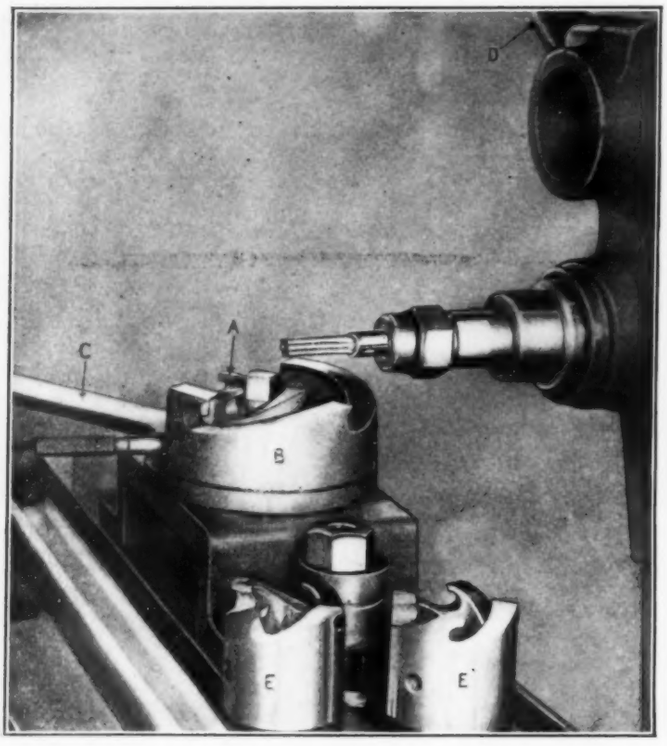



FIG. 9. MILLING STARTING-CRANK CLUTCH ON HAND MILLER

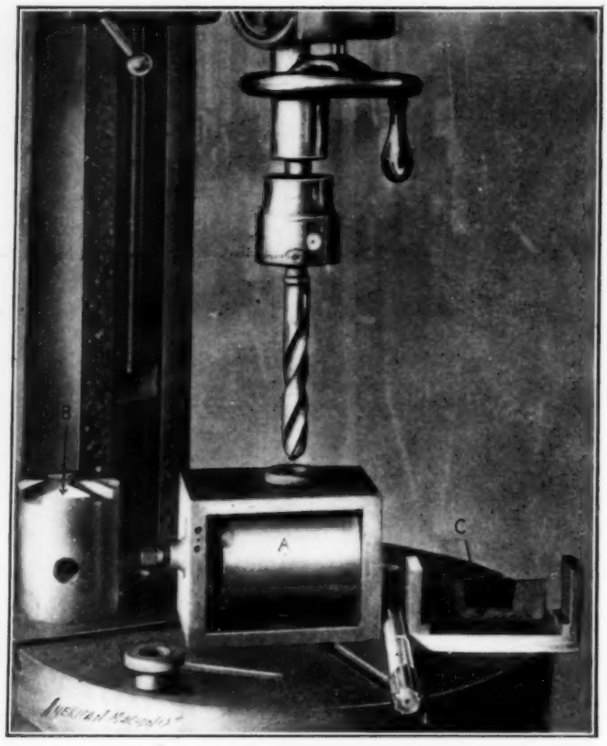



FIG. 10. DRILLING AND REAMING WRIST-PIN HOLES IN PISTON WITH REFERENCE TO CORED PORTS IN TOP

being done on a Baush radial drill press. Both end bearings are bored and reamed, using the fixture shown. It is afterward necessary to bore the side opening in the differential housing with exact reference to the bores of the end bearings. This work is also done on a radial drill press as shown in Fig. 8. The guiding jig shown on the table of the press, at the left, is inserted into the casting and the four curved shoulders, one of which is marked *A* in Fig. 8, rest in the bored shoulders of the casting, also marked *A*, in Fig. 7. Thus located, the bushed hole guides the bottom end of the boring tool,

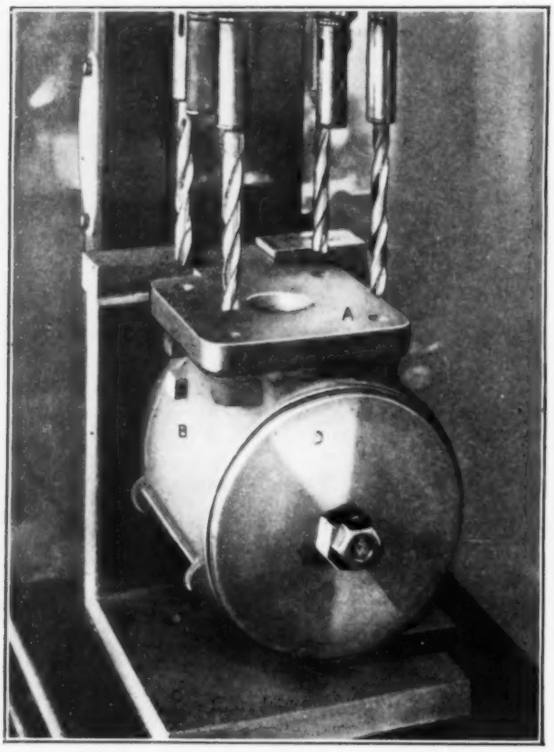



FIG. 11. DRILLING FOR STUDS ON TOP OF CRANK-CASE ELEMENT

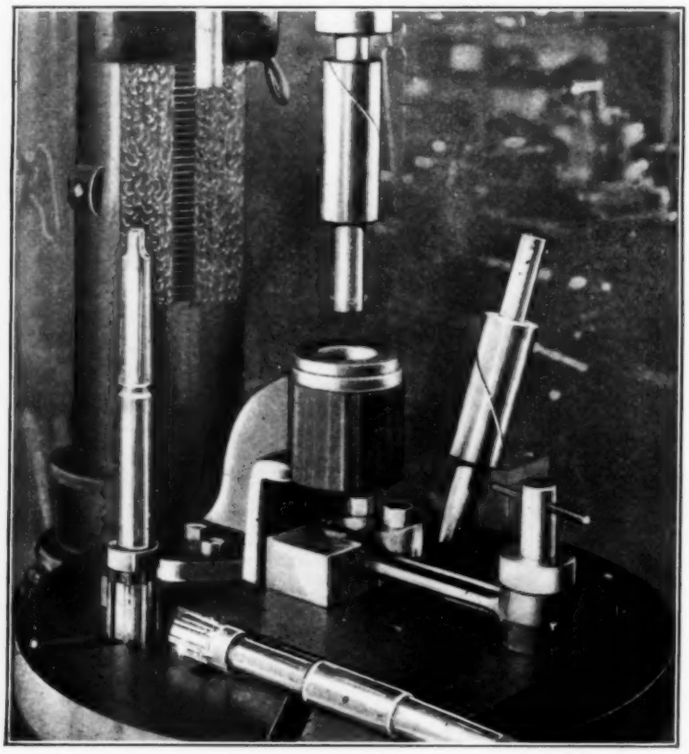


FIG. 12. BORING AND REAMING CONNECTING-ROD ENDS TO LENGTH

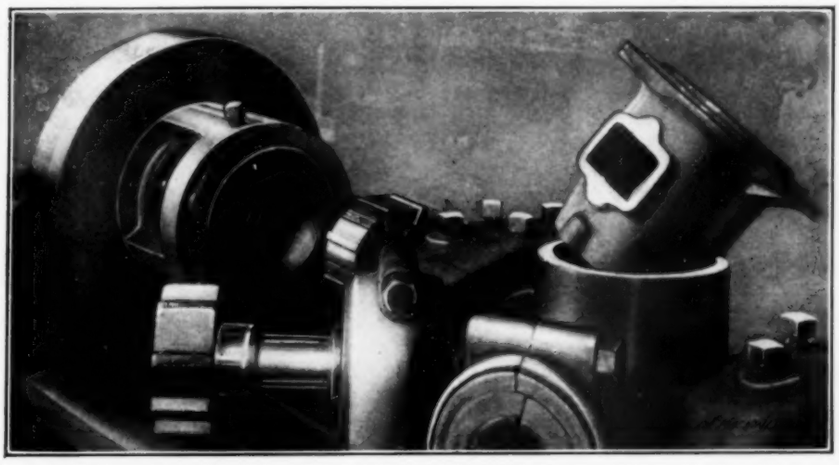


FIG. 13. REAMING AND TAPPING PINION HOUSING ON A JONES AND LAMSON

the cutting edge of which is at *B*, in Fig. 8.

### A HAND MILLING JIG

Fig. 9 illustrates the profiling of the starting clutch, on a hand milling machine. In this illustration, *A* shows the work in place, two examples of which are at *E*. *B* is a guide, the shank of the milling cutter being brought down upon the curved top surfaces of this guide, while the cutting edges remove the metal from *A*, in the shape shown. The whole fixture *B* and the work *A*, are revolved by the handle *C*, as the cutter is brought down by the handle *D*.

### DRILLING AND REAMING WRIST-PIN HOLES

In Fig. 10 is shown a box jig for drilling and reaming wrist-pin holes in the pistons. In this illustration *A* is the piston, another one of which is shown at the left. In this case, *B* shows one of four projections at the top of the piston, which form ports when the piston uncovers suitable openings in the side of the cylinder, as in most two-cycle engines. This necessitates that the wrist-pin hole must be in exact reference to these ports, and in order to secure this, the piston *A* is located in the box jig by means of the gage *C*. This gage fits over the jig sides and also over the projection on the piston head, thus giving the proper location.

Fig. 13 is interesting chiefly on account of the large size of the tap used for cutting the thread in the end of the pinion housing, as it is held in the fixture shown. Fig. 11 shows a jig for drilling the stud holes in the top of the crank-case element *B*.

The main portion of this jig is marked *C*, in the illustration and the upper guiding plate *A*, containing the drilling bushings, fits down into an opening in the upright portion of *C*, thus locating it with reference to the work. The crank-case element is held on a boss projecting from *C*, by means of the cover plate *D* and the bolt passing through the center. Support is given to the casting from underneath, by a suitable wedge.

Boring and reaming of the ends of the connecting rods are shown in Fig. 12.

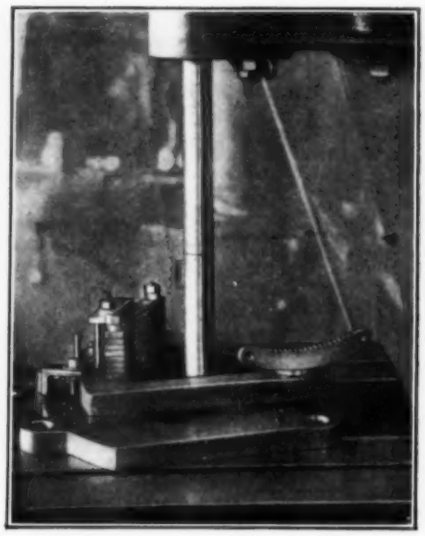


FIG. 14. CUTTING QUADRANT TEETH ON KEYSEATER

By means of this fixture the exact length of the connecting rod is definitely secured.

### CUTTING QUADRANT TEETH

Fig. 14 shows the cutting of the teeth in the clutch lever quadrants on the keyseater. As shown, 9 or more quadrants are piled one upon the other, held by two studs passing through the holes in the ends of the quadrants. These studs screw into a fan-shaped section of the fixture which swings about a center at the right of the cutter bar, this center determining the correct radius for the quadrant. The upper swinging fan-shaped section is held in position with reference to the lower part of the fixture and the machine table, by a suitable ratchet on its outer rim, so that as the cutter bar descends it cuts the teeth in the series of quadrants, with the proper spacing.

# Night Work; Supervision, Instruction

By John R. Godfrey

*Some things to be considered in night work.*

*The cost of supervision with different kinds and with low grade help.*

*How instructors are being used to increase output in railroad shops.*

When the pressure of business gets beyond the normal capacity of the shop and you seem to be at the limit of rearranging machines and methods so as to increase the output in this way, it becomes necessary to either enlarge the plant or run it at night. It is pretty generally conceded that it very seldom pays to run at night with the day force, as the production is very sure to suffer either in quality or quantity, or both. Of course, there may be times when it seems to be the only way to run two or three evenings per week until 9 or 10 o'clock, but these are exceptional, and if night work is to be done it is usually far better to employ an entirely separate force.

No shop manager or foreman needs to be told that this involves more difficulties than might appear on the surface. If every man on the day force could finish up his work before leaving, so that the night man could start fresh, it would be a very much simpler proposition. But when it comes to lapping a night man onto the same job, all sorts of difficulties are involved.

One of the mistakes often made in beginning night work is the lack of sufficient supervision. Although a superintendent and a full quota of foremen are considered necessary in the daytime, there are comparatively few cases where a night superintendent is employed in an ordinary shop. Oftentimes the day superintendent hangs around for an hour or so, or perhaps drops in some time during the evening. But it is not usual to have a regular superintendent for the night force.

As a matter of fact, the night force generally needs more supervision than the day force, because they are usually new men on the work, as all the regular men prefer to work in the day gang. In only one shop that I recall among those visited during the past year, has a night superintendent been employed, and it is hardly necessary to say that the production of the night force in this case came very much nearer equaling the day force than in most instances.

### Low Priced Men Need Most Supervision

While speaking of shop supervision, there is a point which often escapes attention in this respect. Many shop managers seem to delight in employing as low-grade help as possible and entirely overlook the well known fact that this usually means a largely increased cost of supervision. As one foreman expressed it to me, "With the kind of men we are hiring now in this shop, there should be a foreman to every four men in order to make any showing on production and prevent undue damage to machines."

### Superintendence

The question of superintendence has many phases and is looked at in various ways by different shop managers. The qualifications required seem to run from that of a "slave driver," or a man who can force the last bit of work from his men, to the paternal superintendent, who looks on the shop force as members of his own family. In some cases superintendence consists in simply laying out the work to be done and inspecting it after it is finished. In others it takes the form of instruction, or combines this with the other qualities mentioned.

Superintendence may perhaps be rightfully considered as the guiding hand which keeps everything moving smoothly, just as a general in the army plans and directs a campaign or a siege. While it is absolutely necessary to secure production, it is of itself essentially nonproductive, and, assuming that all men in the shop receive the same pay, it would be economy to secure men who require the least possible supervision. The less supervision any man requires, the more valuable he is to his employer, and the total cost of the work produced should always include the cost of supervision. If this is done, it will often be found that low-priced men are not as cheap as indicated by the payroll.

### Instructing Workmen

There is another point in shop management which is overlooked in too many cases, or is, unfortunately, combined with supervision. This is the coaching or instructing of men as well as boys as to the best way of producing work. This was formerly supposed to be done by the foreman, but when he is as busy as he must be in the modern shop, in securing the desired production, he has little time to spend in instructing anyone.

Instruction should be entirely separate from supervision, and some of the larger shops, particularly railroad shops, are so thoroughly convinced of this that they employ men who do nothing else. They are constantly on the watch for improved methods, and by keeping constantly in touch with the foreman, they are able to increase production to a very marked degree. While such an arrangement allows excellent opportunities for friction of the three-cornered kind, among the foreman, instructor and the men, there is absolutely no necessity for this if all are plainly given to understand that they are working for their own best interest, as well as that of the company, when everything is going smoothly.

### Make Instructors of Your Best Men

When you find an exceptionally good planer hand who is securing much more work from his machine than any other man on the job, it will often pay to make him an instructor, for by increasing the output of a dozen men and machines he can earn more money for the shop than by his own large production on a single planer. Pay him his maximum earnings, or even more, and do not make the mistake of looking on him as an expense, but remember that he is increasing the producing capacity of machines which represent many thousand dollars of your good money.

# Drill Press Work on Screw Machine

By S. H. Bacon

*A method of performing cross-drilling operations on a special piece of work with the spindle positively controlled in an unusual manner.*

Most screw-machine men are familiar with the usual way in which parts are cross-drilled on the Brown & Sharpe automatic screw machine, where one of the spindle pulleys is strapped down with a special attachment so that the spindle stops dead, instead of reversing as for threading. I wish to show how the cross-drilling has been accomplished successfully without the special spindle brake, also how more than one hole was drilled, each hole in proper relation to the other or located correctly in flat or hexagon stock, as in Figs. 1, 2 and 3.

### The Stop Pin for the Spindle

The first piece that I saw drilled in this manner was done with a loose belt on one spindle pulley, and a heavy pin protruding from the chuck cap. When ready for drilling, we shifted to the loose pulley, the pin in the chuck cap coming in contact with a small steel block fastened to the drilling attachment on the cross slide, thus stopping the spindle while we drilled.

The arrows in Fig. 4 show how we improved this method by twisting the loose belt. This caused the spindle to reverse when the clutch was shifted, but the stopping pin was in contact before the spindle could get started in the opposite direction. We did this because we found that at the end of a day's work the stop pin had tightened the chuck cap so that we had great trouble in loosening it. It will be noticed that the loose belt sliding over the pulley would keep the pin in contact with the block and the spindle dead while drilling.

### An Unusual Piece of Work

Fig. 1 shows an unusual piece completed in this manner on a Brown & Sharpe No. 00 automatic in 6 seconds, or at the rate of 6000 in 10 hours. In Fig. 5, the pin in the chuck is shown at *A*, and the block at *B*. A special stop is shown at *C*, which is held in the drill guide *D*, and is adjustable for length.

By holding the stop in the drill guide, instead of using another hole in the turret, we save revolving the turret once. This is only one second saved, but in the above case it amounted to 462 pieces in 10 hours.

### Feeds, Speeds, Etc.

The speeds are the fastest and slowest we can use together; 2400 revolutions per minute backward, and 927 revolutions per minute forward; material, brass; extreme surface speed of stock (corner of stock), 175.6 feet per minute. The drill could have been run much faster, but we use the slotting attachment pulley. This gives 2430 revolutions per minute.

The first question that arises is how to set up the job so that the stock will always stop in proper relation to the drill. Fig. 6 shows the gage used for this purpose. *A* rests on the front cross slide and *B* on the back cross slide, while the

slot in the middle holds the stock in position while we set the stop pin and the tools.

Following is the order of operations:

| | No. of Revolutions at 2400 R.P.M. | Hundredths of Cam Surface. |
|---|---|---|
| Reverse and stop spindle with back slide and feed stock to stop | 24 revs. | 10 |
| Drill; 0.232 inch travel, at 0.002 inch feed, = 116 revolutions at 2430 revolutions per minute, or | 118 revs. | 49 |
| Drill drops back to clear | 5 revs. | 2 |
| Drill Guide drops back to clear | 5 revs. | 2 |
| Release spindle by dropping away with back slide; reverse to fast speed | 3 revs. | 1 |
| Cut-off; 0.160 inch travel, at 0.0019 inch feed | 85 revs. | 36 |
| Total number of revolutions to make one piece | 240 revs. | 100 |

DRILLING TWO HOLES IN ONE PIECE

The brass stud shown in Fig. 3 is nurled just before cutting off. As the cross-slide nurls have already been described in the AMERICAN MACHINIST, I will go on, and endeavor to show how to drill the two holes in correct relation to each other.

In this piece we do not have to stop the stock at any particular point, which is necessary for flat stock, but after the first hole is drilled, we must stop the spindle when it has made a quarter turn. To drill the first hole, we stop the spindle, as in the other job, and when the drill drops back the spindle is released, and the loose belt revolves it one-quarter around, when it is stopped again by a stop which is held in the turret.

For drilling the round stock, the drill may be ground blunt, when the drill guide is not used.

ORDER OF OPERATION

The spindle speed is 2400 revolutions per minute backward, and 927 revolution per minute forward; the extreme surface speed of stock, 157 feet per minute; the time for one piece, 11 seconds, or 3272 in 10 hours.

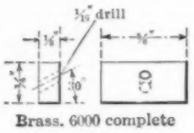
The operations for this piece are as follows:

| | No. of Revolutions at 2400 R.P.M. | Hundredths of Cam Surface. |
|---|---|---|
| Reverse and stop spindle with back slide and feed stock to stop | 22 revs. | 5 |
| Drill; 0.300 inch travel at 0.0023 inch feed, = 131 revolutions at 2430 revolutions per minute, or 132 revolutions | 132 revs. | 30 |
| (Revolve turret while drilling.) | | |
| Drill drops back, spindle makes ¼ turn | 9 revs. | 2 |
| (Stop spindle, with stop pin held in turret.) | | |
| Drill second hole; 0.300 inch throw at 0.0023 inch feed, = 131 revolutions at 2430 revolutions per minute or | 132 revs. | 30 |
| Drill drops back, turret withdraws, releasing spindle | 9 revs. | 2 |
| (Reverse to fast speed.) | | |
| Cut-off; 0.063 inch throw at 0.002 inch feed | 31 revs. | 7 |
| Cut-off and form; 0.084 inch throw at 0.0008 feed | 105 revs. | 24 |
| (Revolve turret 5 times while cutting off.) | | |
| Total number of revolutions for one piece | 440 revs. | 100 |

ORDER OF OPERATION.

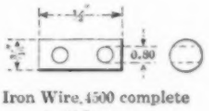
Notice in the above order of operations that the cutoff is fed at 0.002 inch chip until it begins to form, when the feed is reduced to 0.0008 inch.

Many different pieces can be made by using the above method, such as drilling holes in a row, etc.



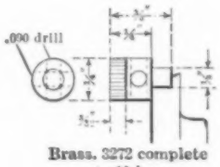

Brass, 6000 complete in 10 hours

FIG. 1




Iron Wire, 4500 complete in 10 hours

FIG. 2




Brass, 3272 complete in 10 hours

FIG. 3




FIG. 4

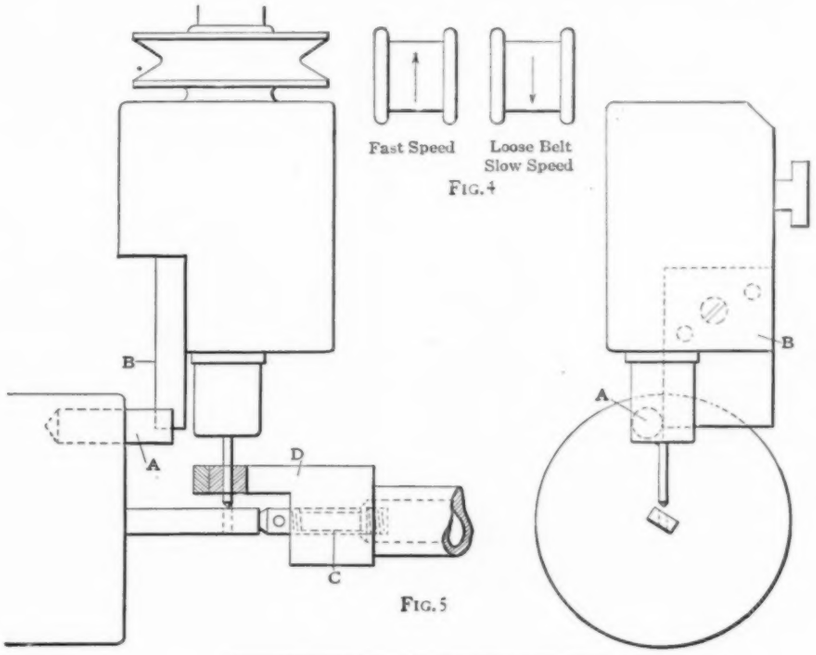



FIG. 5

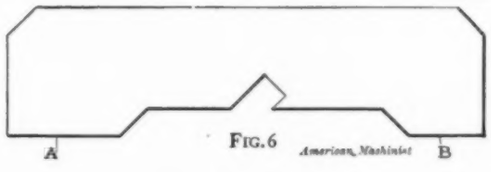



FIG. 6

DRILL-PRESS WORK ON THE AUTOMATIC SCREW MACHINE

## Examination for Testing Engineer

The United States Civil Service Commission announces an examination on July 27, 1910, to secure eligibles from which to make certification to fill a vacancy in the position of engineer in timber tests, $1200 per annum, Forest Service, Madison, Wis., and vacancies requiring similar qualifications as they may occur.

The examination will consist of the following subjects, weighted as indicated: (1) Technique of testing materials, 15; (2) mechanics of materials, 20; (3), thesis (presentation of thesis describing methods and results of some piece of research experimentation in the field of testing materials of construction with which the competitor has been connected), 25; (4), training and experience, 40.

The age limit is 20 years and applicants should apply at once to the United States Civil Service Commission, Washington, D. C., for Form 1312.

# Work on Complicated Brass Valve

By H. P. Cathcart*

*The machining operations on a brass valve present some interesting points. The various parts of the valve require special tools and fixtures and these may be applied to many other jobs of similar character.*

*Speakman Supply and Pipe Company, Wilmington, Del.

The different operations in machining the various parts of the brass valve shown in Figs. 1 and 2, are interesting, owing to the fact that the valve must be sold at a marketable price and the numerous parts that enter into its construction made as cheaply as possible, in order to reduce its manufacturing cost. This has resulted in the perfecting of various devices and attachments for holding and machining the work.

This is known as the Speakman non-scalding valve. As the handle is turned the cold water flows, and by circular movement gradually the warm water starts. The back of the handle points downward to a dial, and by turning the handle to the correct graduation on this dial, any degree of temperature desired can be given the water that comes from the outlet.

### Obtaining Desired Temperature

There are only two things this valve will not do in regard to mixing water; it will not make cold, nor will it make hot water. If, however, you have the cold water at 40 degrees and the hot water at 150 degrees, the valve will mix these in proportions that will cause water to flow from the outlet at any temperature between these two degrees.

The cylindrical mixing chamber of the valve and the spindles are the only working parts. The spindles with disks, close with pressure, while the cylindrical chamber acts as a cam to open the disk. The exact regulation of the measurement of water is insured by the port openings in the cylinder traveling across the openings of the water supply.

In opening the valve, the first movement of the handle raises the disks from their seats, and further movements of the handle allow the hot and cold water to mix in varying proportions. The ports in the middle cylinder are so constructed that when the valve is operated both the hot and cold water are measured accurately and only as much admitted as will make the required temperature.

### Parts of Valve

To the left of Fig. 1 is shown the different parts that enter into the construction of the valve, and to the right is shown the complete valve. An enlarged view of a valve that has been cut open to show the different working parts is shown in Fig. 2.

The valve consists of a main body, two end bodies, two end caps, two spindles with disks with special rubber washers, a mixing plug, balance spring, stuffing box, gland, packing nut, handle, lock nut, dial and wall flange.

In Fig. 3 is shown the stuffing box as it is gripped by air in a special milling machine fo- milling the hexagon sides of the nut.

### Turning Spud and Wall Flange

In Fig. 4 is shown the main body as it is having a spud turned and threaded on the end to hold the wall flange. A finished body is shown on the ways of the lathe. This is done in two operations, with a box tool and die as shown. A common box chuck is used so as to hold the work securely.

Fig. 1. Parts of, and Assemeled Valve

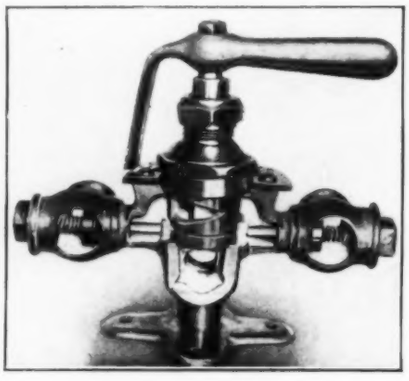


Fig. 2. Valve Cut Open to Show Working Parts

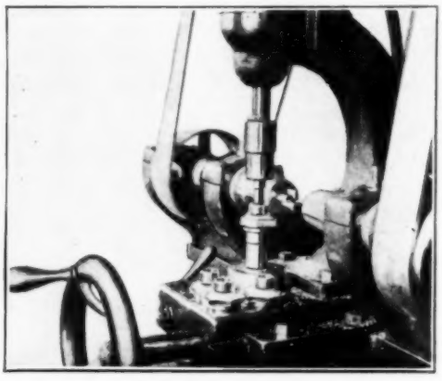


Fig. 3. Special Machine for Milling Stuffing Box

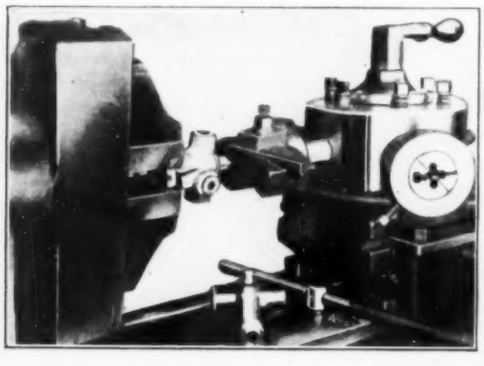


Fig. 4. Turning and Threading Spud

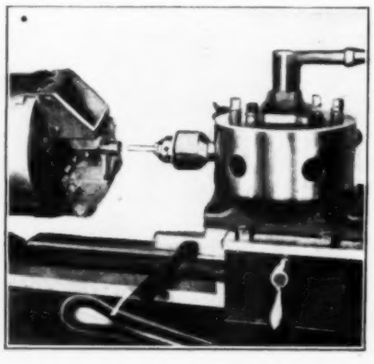


Fig. 5. Turning and Tapping Flange

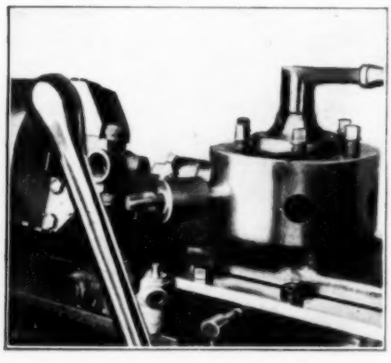


Fig. 6. Tapping Valve Outlet

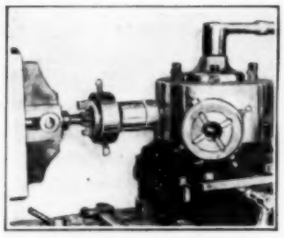


FIG. 7. MACHINING INLET

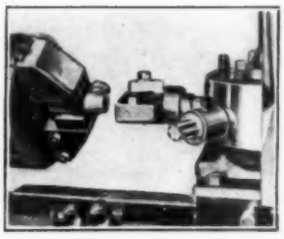


FIG. 8. TAPPING END VALVE

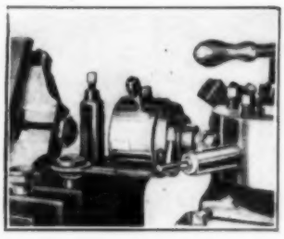


FIG. 9. STUFFING END BOX

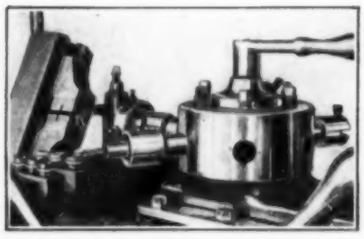


FIG. 10. MACHINING END CAPS

In Fig. 5 is shown the wall flange as it is being turned and tapped. Special blocks are fitted to the jaws of the chuck to form a jig in which to hold the work. The machining is done in two operations, a box tool being used to turn the outside and drill the hole, which is then tapped as shown. The sides are left rough and finished by the grinders and polishers. An air chuck is used as it is much quicker than the ordinary box chuck.

### MACHINING OUTLET AND INLET

In Fig. 6 is shown the air chuck as it is used for tapping the outlet of the valve body. An ordinary flat cutter and half-inch pipe tap are used for this operation.

For machining the inlet valve as shown in Fig. 7, the ordinary box chuck is used, but special blocks are fitted to the jaws of the chuck that fit the irregular shaped body. For this only two tools are used, one being a combination box tool that bores the inside and turns the outside, while the other is a die with cutters that thread and turn the sheets simultaneously.

In Fig. 8 the end valve is being tapped to screw on the main body. This is held in the air chuck while a combination box tool bores it to the tapping size and finishes the bend on the outside. After this the tap is run in.

### STUFFING BOX AND END CAPS

In Fig. 9 the stuffing box is being machined. This is held by special blocks in the jaws of the box chuck, while four tools are being used. The combination box tool turns the outside and cuts it to the proper size for the die, and the die threads it. Then a sizing reamer reams it for the spindles to pass through. After this the thread is relieved by undercutting with the cut-off slide.

In Fig. 10 the end caps are being machined. This is also held in the box chuck while four operations are being performed. First a box tool sizes the outside for the die, chamfers and centers it for the drill. The drill is then used; the hole being a guide for the end spindles, and the tool in the cross slide undercuts the threads to relieve it while it is being tapped.

In Fig. 11 the handle is being drilled, counterbored and broached while it is held in the box chuck.

### THREADING AND TAPPING BODY

In Fig, 12 a screw chuck is used to hold the body in absolute alinement while it is being tapped, for screwing onto the iron pipe. For this operation an ordinary flat cutter is used, and then the tap.

In Fig. 13 the valve is being held in the air chuck while the seat end is being threaded. A box tool is used to bore the proper sized hole, turn the end the correct size for the die, cut the extension piece for the seat and cut off the rough edges and form the neck; the latter operation being performed by pulling over the handle shown on the box tool. After this, the die is used to cut the thread.

In Fig. 14 a screw chuck is used to hold the end body while it is being tapped for the end cap. A box tool bores to the tapping size and cleans up the outside of the valve, after which it is tapped.

### PACKING NUT AND GLAND

The packing nut end of the stuffing box is being machined in Fig. 15. A box tool

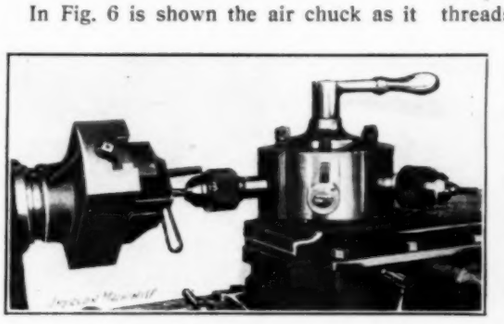


FIG. 11. DRILLING AND BROACHING HANDLE

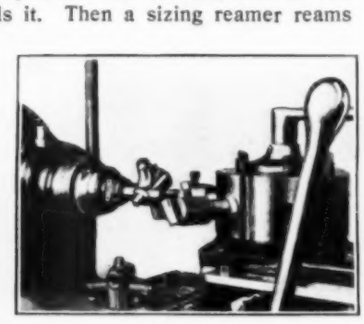


FIG. 12. TAPPING FOR IRON PIPE

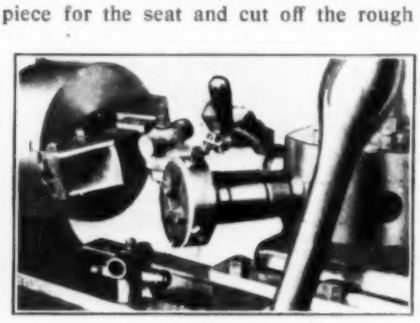


FIG. 13. THREADING SEAT END OF VALVE

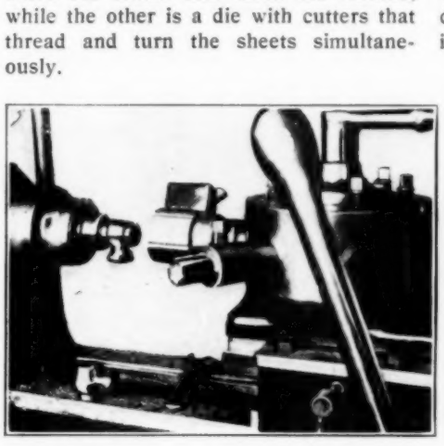


FIG. 14. TAPPING FOR END CAP

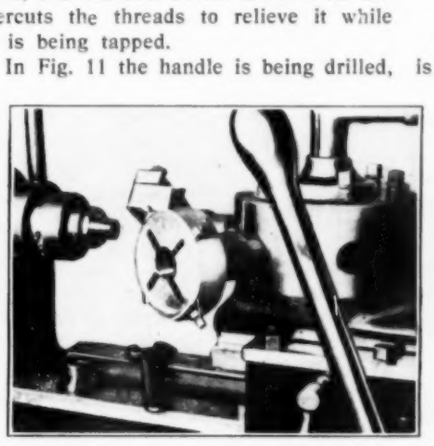


FIG. 15. FORMING PACKING NUT END

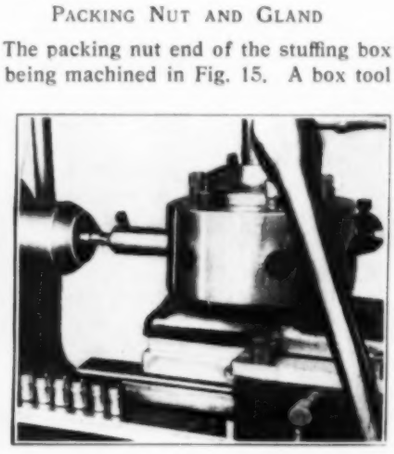


FIG. 16. MACHINING GLAND

with a very large blade is used for forming the piece, sizing it for the thread and gland, and boring the hole. The die is then used to cut the thread.

The gland as it is being machined is shown in Fig. 16. Both ends of this are plain, and a common box cutter is used to burn it, after which the hole is drilled and reamed.

In Fig. 17 is shown the forming of the packing nut. To form this, a common tool-post former is used. After this a flat cutter faces off the end and the hole is tapped.

The most important operations are shown in the next five illustrations. Here the body is being machined in Fox lathes, to a taper of 1½ inches to the foot. Before taking out of the machine it is tapped for the stuffing box.

### Fitting Plug

In Fig. 19 is shown the smooth bore catching the reamer in the live head. An ordinary piece of pipe is screwed in the valve to prevent it from turning, and the tailstock is brought up against the valve to size it with a fluted reamer. The ring shown on the reamer is a stop to regulate it for the proper depth. This makes the valve bodies all alike and interchangeable. The reamer also cuts a small circular ring for the plug to sit on at the bottom of the valve. This prevents the plug from sticking in case it is hit on the top. The plugs are ground enough to allow for expansion and contraction.

In Fig. 20 the seating operation is being performed. The seating tool is placed in the live head and a hardened steel plug is placed in the valve body. The seating tool is then brought up and cuts the seat until a pin in the tool touches this hardened steel plug in the body. This makes the seats the same distance from the center to the end. The operator holds the plug in the valve while he brings up the back head to center the valve against the seating tool.

To insure that this work has been done properly and no wear has taken place on the seating tool, an inside micrometer gage is used on the seat, as shown in Fig. 21. This shows that the distance from the plug to the end is correct.

### Turning Plug

The stem of the plug is turned with a tool in the slide rest of the Fox lathe, as shown in Fig. 22. The taper of the plug, of 1½ inches to the foot, is also turned in the same way. These plugs are all fitted in a steel-hardened gage to give the proper diameter, depth and taper. This makes them interchangeable and they are then ground into the body in which they are used.

The end spindles of the valve are made from rods. The center disks are machined by drilling and counterboring for the washers, after which they are set in, tapped and cut off. The stem that runs through the disk is shouldered with a box tool and then threaded with a die so as to screw the disk onto the stem. After assembling the stems are placed in a steel-hardened jig and filed down to make them all the same length. The springs are made of phosphor bronze wire, and the nuts that hold the handle on the plug are made of hexagon brass rods.

While the operations performed on a valve of this kind are more or less special, they may suggest a suitable sequence of operations on other kinds of work and the use of various tools.

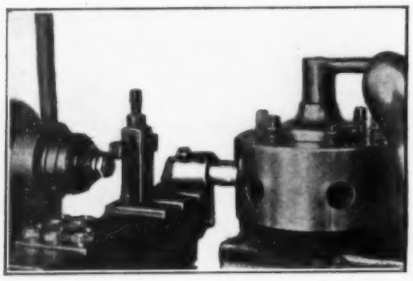


Fig. 17. Forming Packing Nuts

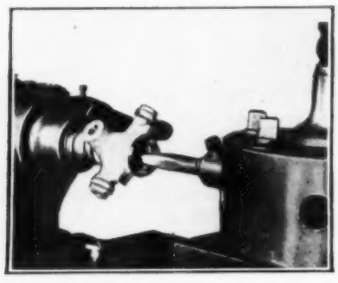


Fig. 18. Boring Taper Hole

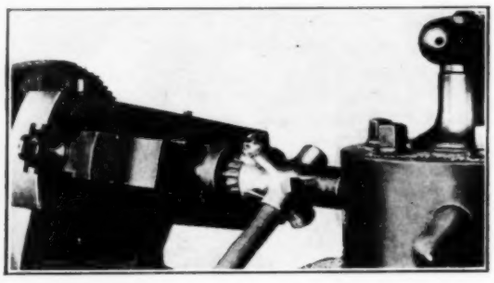


Fig. 19. Reaming to Exact Size

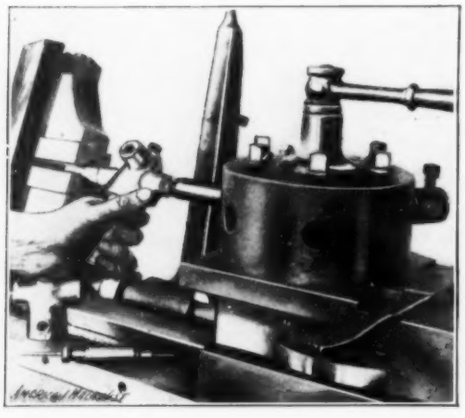


Fig. 20. Seating Operation

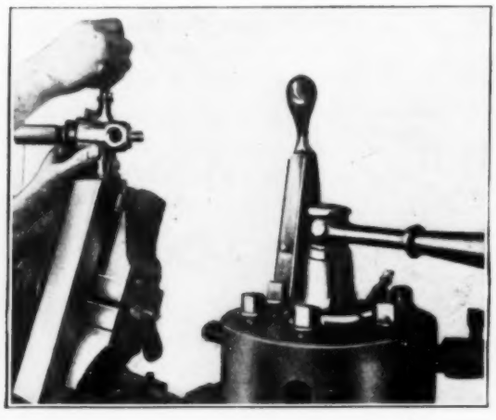


Fig. 21. Gaging the Seat

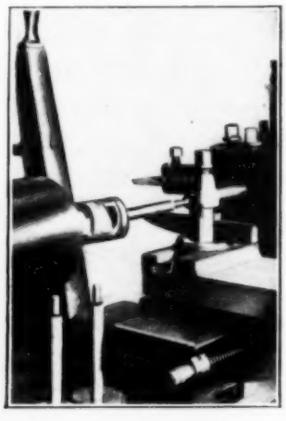


Fig. 22. Turning Plug Stem

## Railroad Instruction by Correspondence

The Union Pacific railroad is trying out a plan for increasing the efficiency of its men by means of a correspondence school for its employees. This includes men of all grades and its main object is to make the men more capable in their present work as well as to fit them for better positions. It is also arranged to allow for men to study for other departments in some cases and the instruction is in charge of officers of the company. This should tend to bring the officials closer to the men, which is much to be desired in all cases.

# Electrically Driven Drop Hammer

By I. William Chubb

*An English power hammer designed to combine the economy of the electric motor with the easy control of steam.*

With a steam hammer there is admitted to be a waste by leakage, condensation, etc., which cannot easily be avoided; Brett Patent Lifter Company, Ltd., Coventry, England, therefore, while believing that from the point of view of economy a motor-driven drop hammer would be desirable, have, in the design of such a machine, kept also before themselves the two requirements that the hammer thus constructed must be capable of being controlled with just the same ease as a steam drop hammer, up to large size, and further that a stamper accustomed to driving a steam drop hammer should be able immediately to work the new type and turn out stampings at least as quickly. It is said that tests of performance prove these requirements to have been met.

Three Brett drop hammers of the new type, electrically driven and having heads weighing 1344, 784 and 1800 pounds are shown in Fig. 1. The general lines of construction of the hammer need no description. The appliance is carried on a concrete bed and the overhead gear is supported on top by a girder frame which is carried by built-up columns, or joists braced together. The drive of all three hammers is by a single electric motor through speed reduction gear, onto a shaft which is continuously running.

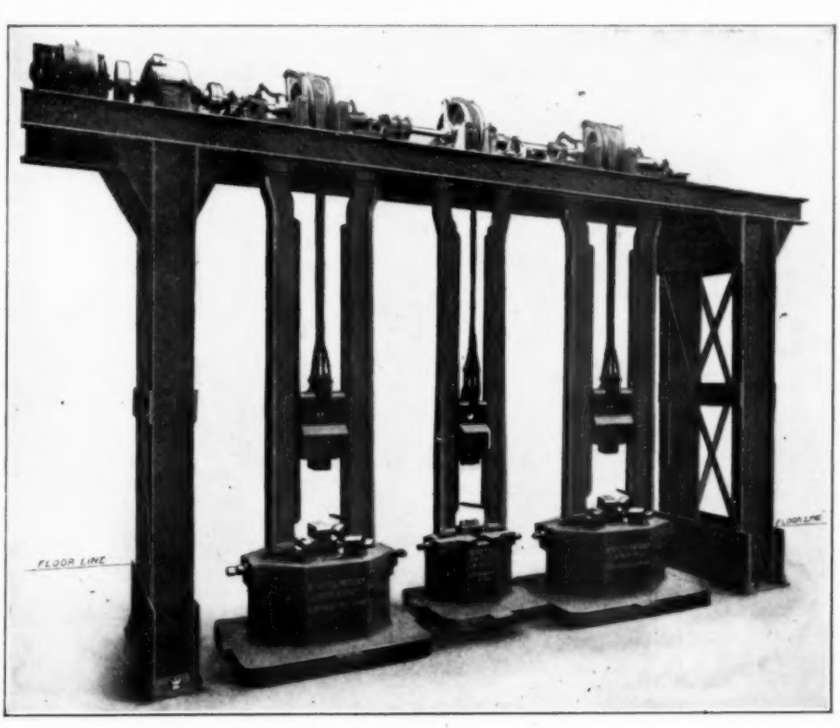



FIG. 1. BRETT ELECTRICALLY DRIVEN DROP HAMMER

It is the lifting gear which is of chief interest, and this is shown more clearly in Fig. 2. Two V-grooved cast-iron drums $A$ and $A_1$ are keyed to the shaft, and, therefore, always revolve with it. Between them is a loose pulley over which the rope, carrying the head, turns to some extent. Thus a central pull is obtained on the hammer and, as will be seen, a free fall. Fitting to the grooves of the drums are gunmetal brakes $B$ and $B_1$; the number of these grooves and blocks varying somewhat according to the size of hammer. They are carried on a cross piece $C$, the ends of which are pivoted to the ends of the lifting arms $D$. On the lower ends, these arms encircle the main shaft, the bore being large enough to provide ample clearance. The two brake blocks take the power from the V drums to the shackle, which is connected to the hammer head by ropes, as shown in the illustration. At $E$ and $E_1$ are sliding

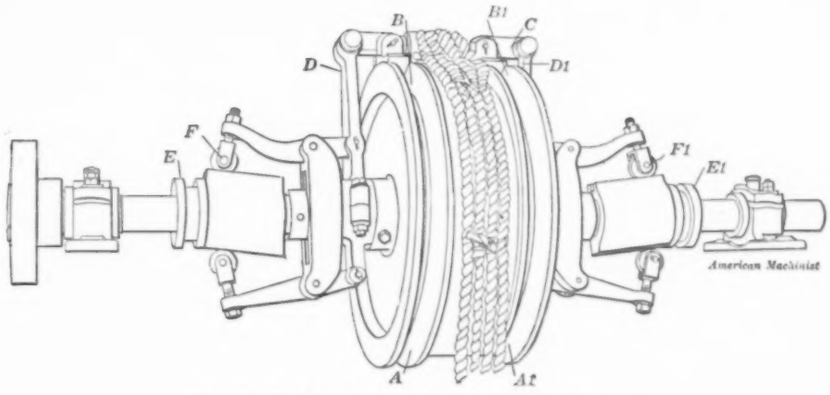



FIG. 2. MECHANISM OF BRETT POWER HAMMER

blocks. If, by means of hand-controlled levers these blocks are moved inward, the effect is to raise the rollers $F$ and $F_1$ along the inclined grooves and in this way the brake blocks can be forced into the grooves of the pulleys $A$ and $A_1$ so as to grip them. The arms, therefore, rotate with the shaft and the hammer head is lifted. Of course, when the sliding blocks $E$ and $E_1$ are moved outward the reserve action occurs and the hammer falls.

It is claimed that hammers on this principle have been built up to two tons, which are easily controlled by a boy, and a 6700-pound hammer can be run without hard manual labor. In hammers of this type, owing to the possibilities of shock, it is obviously necessary either to provide a motor of high power as compared with the average demand, or as here, to use a flexible construction, allowing a certain amount of slip at the critical time. The brake blocks can be held with just enough force in the grooves, that the friction thus set up between the surfaces is sufficient to keep the hammer head suspended in any required position. That grease will not cause the blocks to slip has been demonstrated by pouring fat and grease upon the blocks, without affecting the working. It is also claimed that the gunmetal blocks do not become unduly hot; no trouble arising from this source.

The hammers are, of course, also furnished in single units.

# Some Vertical Miller Operations

## Editorial Correspondence

*Milling spiral grooves or scrolls in a Becker vertical machine with a rotary table attachment and compound gear train for feeding the table laterally during the rotation of the work.*

*Another machine equipped with a special rotary fixture and readily operated clamps for holding trolley wheels which are fed continuously under the cutter while their flat faces are machined.*

*An accurate attachment which is placed on the finished surface of the miller knee for boring the cylindrical head of the miller during the process of construction; a slot-milling device and special turning appliance used in connection with the boring fixture.*

The accompanying halftones illustrate some interesting things recently accomplished at the works of the Becker Milling Machine Company, Hyde Park, Mass.

### Machine Arranged for Cutting Spirals

Fig. 1 shows the Becker vertical miller equipped for the special purpose of cutting a spiral groove or scroll in a disk. This operation requires the rotary-table attachment for revolving the work under the cutter; at the same time the table must be advanced laterally. Of course, the longitudinal movement is very slow as compared with the rotary advance of the work, and to accomplish this very slow table travel, a special compound gear train was provided as clearly shown in the illustration. This arrangement of gears cuts down the table feed to the required rate relative to the rotary feed of the work, thus giving the correct spiral.

### Milling Trolley Wheels

The machine in Fig. 2 is shown in operation upon trolley wheels. These wheels are split and upon coming to the milling machine the two halves of each wheel are held firmly together upon the face of the rotary fixture while the wheel faces are milled off. The fixture is adapted to carry ten complete wheels and it is provided with five fixed locating blocks, against which the wheels are pressed in opposite directions by removable clamps, one of which is plainly shown at the front of the fixture.

The milling operation is a continuous one and is performed rapidly. The operator removes each clamp after the work held by that clamp has passed the cutter, drops a fresh pair of wheels into place, retightens the next clamp, and so on. With this method the work passes under the cutter at the rate of ten wheels per minute.

### A Boring Fixture

The next illustration, Fig. 3, represents an operation in connection with the building of the vertical miller. It shows an ingeniously designed fixture for boring the cylindrical hole in the head of the Becker new-model vertical machine.

In order that this head shall be bored out as accurately as possible, the faces and edges of the column bearing and the bearing surfaces on the knee have been scraped, and the top of the knee which receives the saddle is also finished. The boring fixture, when put in place, is then held in the same manner as the miller saddle will be when the machine is assembled.

### Principal Features of the Fixture

The fixture consists primarily of a very rigid vertical boring head attached at the

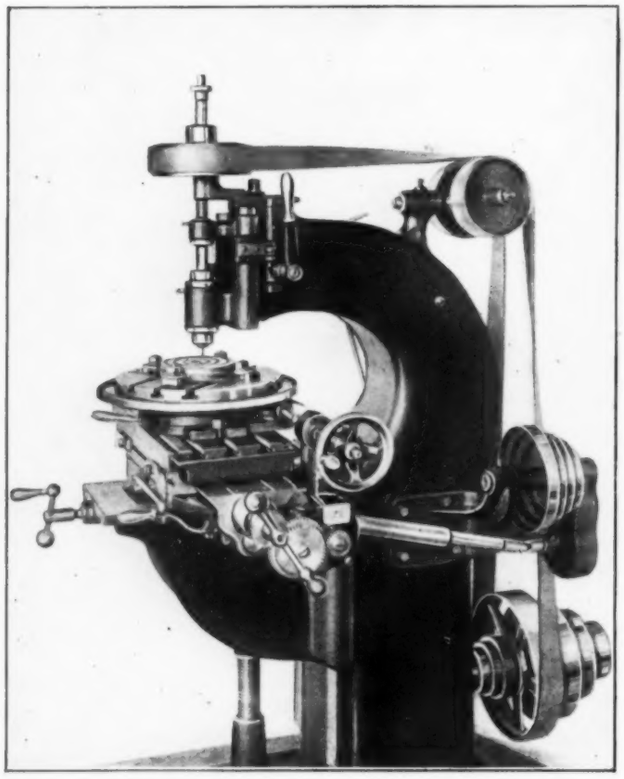


Fig. 1. Cutting Spiral Grooves in Disks

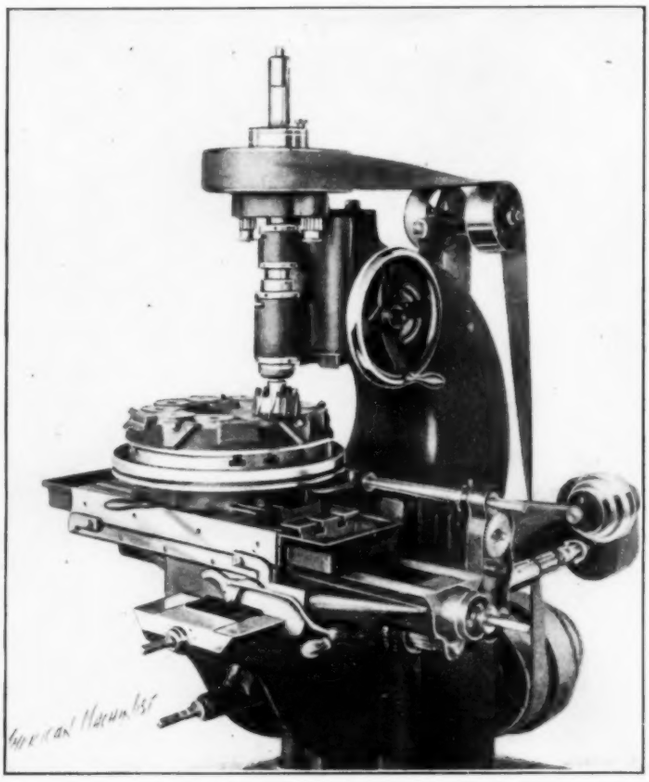


Fig. 2. Milling Trolley Wheels

bottom to a large worm gear which is adapted to be rotated by a worm mounted on a shaft which is driven by gearing from the pulley shaft shown at the left-hand side of the fixture. The upper end of this vertical boring bar carries a single-point cutter which removes the greater part of the metal from the cored hole. A little further down is mounted the inserted tooth-finishing cutter or reamer, which has only 0.002 or 0.003 inch to remove in order to bring the hole to size. This finishing head is so constructed as to permit the inserted blades to be readily adjusted in order to maintain the standard size of hole.

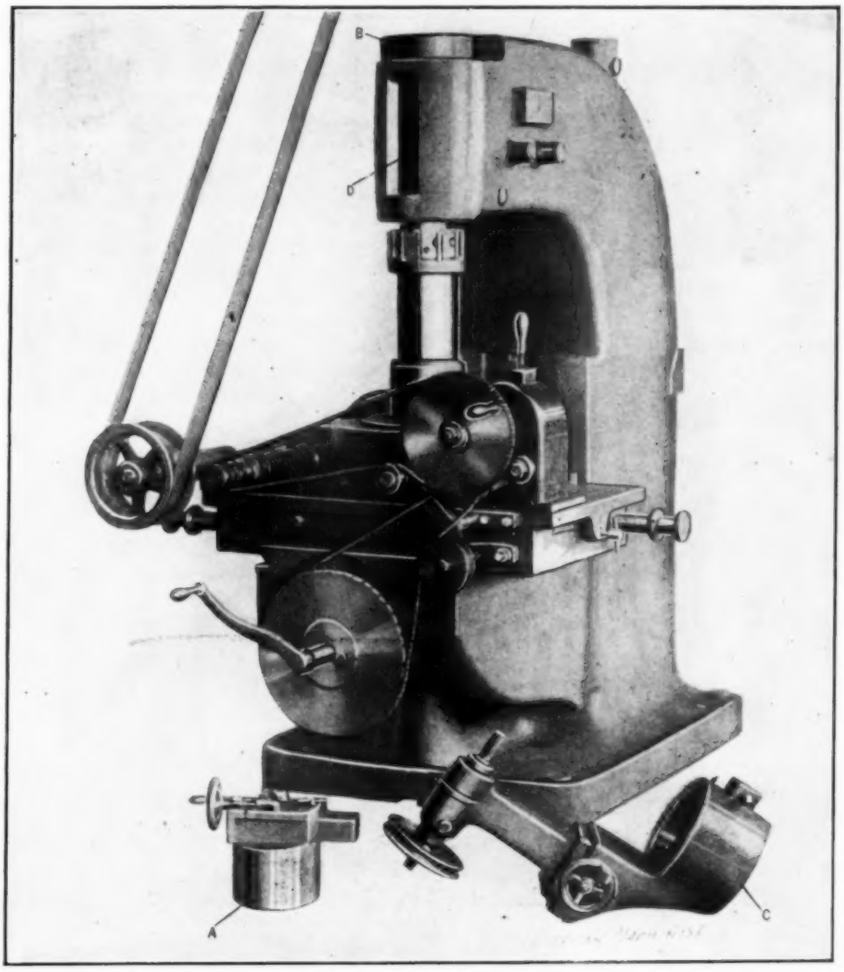



FIG. 3. SPECIAL ATTACHMENT FOR BORING, SLOT MILLING AND TURNING THE HEAD OF BECKER MILLER

### THE FEEDING MECHANISM

The cutters are fed vertically through the head by automatic operation of the knee-elevating screw. The drive for this is by chain and sprockets as clearly represented in the halftone. As will be seen, the first chain transmits motion from a sprocket, which may be connected by a clutch to the worm shaft, which rotates the boring head. The large sprocket deriving its movement from this chain transmits motion in turn to the gear box just to the rear and by means of which three speed changes are obtained for the driving sprocket of the second or lower chain, which leads down to the large sprocket for actuating the knee-elevating mechanism.

The method of mounting the boring fixture in place and the means of adjusting the upper portion prior to commencing boring operations are plainly brought out by the engraving.

### A SPECIAL TURNING DEVICE

Two interesting attachments for this boring fixture are shown in the foreground of Fig. 3. The attachment at *A* is designed for machining the cylindrical boss *B* at the top of the head. Attachment *A* fits over the top of the vertical boring bar and carries a cross slide with a projecting cutting tool at one end, which, when the head is rotated, acts as a single-point turning tool for turning the portion of the casting referred to. The feed in this case is, of course, downward.

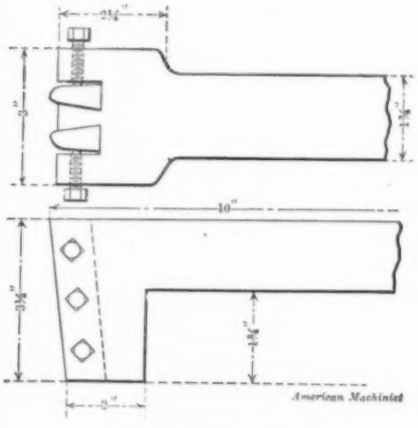
### A SLOT MILLING ATTACHMENT

The attachment shown at *C* is for milling the vertical slot *D* in the front of the head. This attachment fits over the lower end of the boring bar or post to which it is rigidly clamped when properly adjusted. The rotating head itself is also clamped firmly against movement during the slot-milling operation. The spindle at the upper end of fixture *C* is adapted to carry an end mill and is driven from overhead by a belt fitting the grooved pulley on the spindle. The upper half of the milling head is adjustable laterally to position the cutter as required, by means of the handwheel shown at the front of the device.

F. A. S.

## A Substantial Double Tool Holder

It seems to be pretty generally conceded that vibration of the cutting tool is responsible for much of its dulling or breaking down, which indicates the advisability of making tool holders as rigid as possible.




DOUBLE TOOL HOLDER

The accompanying illustrations show a very substantial tool holder which was designed by Mr. Beck, and used in the Gleason Tool Works, in Rochester, N. Y., for turning bevel gear blanks on one of the special Bridgeford lathes built for this purpose.

The dimensions indicate the substantial proportions of this tool holder and the cutters are held in place by three set screws on each side, which force the cutter against the wedge-shaped surface provided for it. These tool holders have been in use for several months, and are proving very satisfactory in every way.

Steel bands for power transmission has now become a well known development, but a more recent invasion of the leather-belting field is now reported in the application of paper belting made in England, the claim for it being that it is stronger than leather, will not stretch, and is less subject to climatic changes.

# Automatic Can Making Machinery

## Editorial Correspondence

*The tremendous quantities of food products now dispensed in tin cans has brought into use high-speed automatic machinery.*

*Construction and operation of machines for automatically forming, seaming, soldering, heading and hemming.*

*An interesting testing machine to discover any leaks in cans.*

When it is considered that by far the vast majority of the food products which we consume come in tin cans, it is not difficult to realize that machinery for making these cans is a very important branch of manufacture.

Tin cans may be roughly divided into two main classes; first, there is the soldered or packers' can; and then there is the open top or so called "sanitary" can. In the case of the packers' can, one of the covers has an opening in the top which is somewhat smaller than the diameter of the can, and it is this opening which is closed by a soldered cap, after the goods are put inside. In this form of can, not only is the side seam soldered, but also the top and bottom are soldered to the body.

In the case of the open-top, or sanitary can, these are shipped with only the bottom in place and with the entire top separate. For these cans there is no small cap to be attached to the top, but the head of the can itself forms the cover. In this sanitary can, also, the top and bottom seams are folded over upon themselves or "double-seamed," and there is no soldering used in these top and bottom seams. In order to make these unsoldered seams airtight a thin coating of a rubber-like substance is applied to the parts before they are put together and the tight rolling down of the double seam squeezes this material in the space between the sheets, entirely filling up the cracks and making them airtight. While it is supposed that this form of seam makes a sanitary can, due to the absence of solder and the necessary application of acid in the soldering process; this is an exaggeration, for, even in the sanitary can the side, or body seam is soldered, just as is the case with the ordinary packers' can.

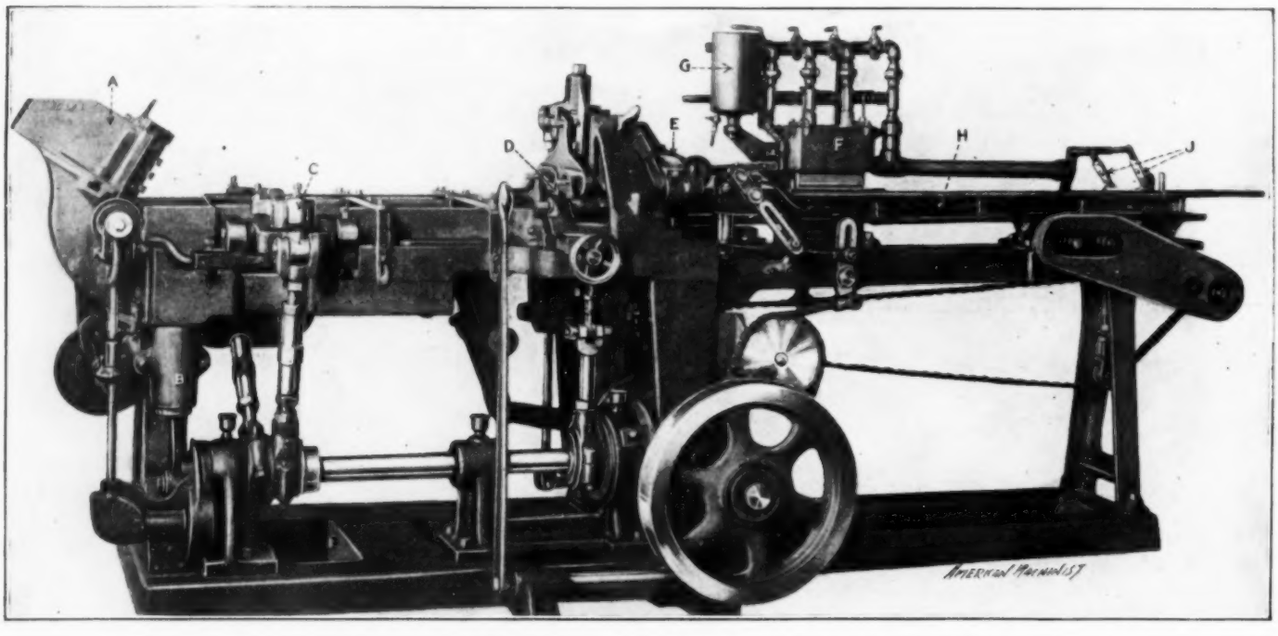



FIG. 1. AUTOMATIC LOCK-SEAM BODY MAKING AND SIDE-SEAM SOLDERING MACHINE

### FORMING, SEAMING AND SOLDERING THE BODIES

Slitting the sheets of tin into strips which are afterward formed into can bodies is the first step in the manufacture. This slitting is done on a machine carrying several rotary slitting cutters on an arbor. After the sheets have been cut to width and length, they are taken to the machine shown in Fig. 1. Here they are piled in the receiver *A*, and a suction arm is brought up, drawing away the bottom sheet by means of vacuum, produced by the vacuum pump *B*, also shown in Fig. 1.

This sheet is next carried to the notcher at *C*. Here, when making bodies for the open-top or sanitary can, notches are cut from the corners of the sheet, the object of this notching being to remove the metal where it would be doubled over in too many thicknesses when the ends are double-seamed. For a packers' can whose end seams are not folded over, this notching is unnecessary, and this portion of the machine is omitted.

After this, the sheet passes on under the yoke shown at *D*, where a pair of arms rise up to curve the sheet around an arbor or horn. While being carried to the arbor the sheet is edged, that is, the two edges are hooked; one edge turned up and the other turned down, at a little more than a right angle; then, when the sheet has been wrapped around the arbor, the two hooks lock together. At this point wedges enter the arbor, causing it to expand and draw the metal tight, while the yoke at *E* comes down and presses the lock seam tightly together. This makes the seam in the side of the can body, which, however, is not airtight, but has to be soldered.

Soldering is done after the arbor has released the can body, and it is carried along the conveyer *H*, passing first under an acid applier and then under the soldering iron below *F*. This consists of a piece of iron loosely supported inside of a frame having numerous Bunsen gas flames playing upon it. The iron thus being hot, a continuous piece of wire solder is fed against it and as the can bodies pass below it, this solder is trans-

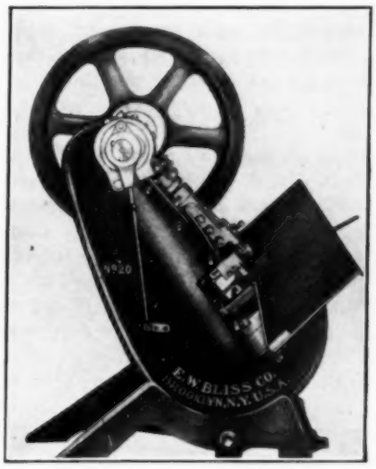



FIG. 2. PRESS WITH STAGGER-FEED TABLE

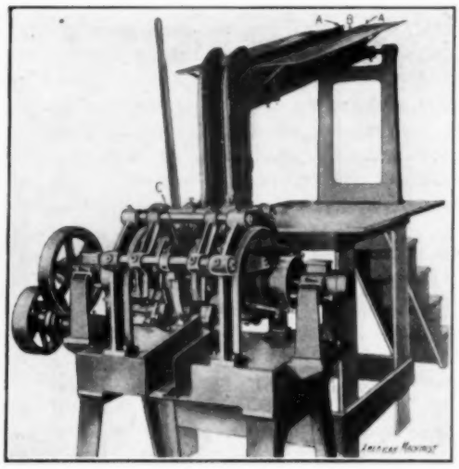



FIG. 3. AUTOMATIC ROUND-CAN HEADER

ferred to the seam of the can, penetrating into the cracks between the sheets of tin, so as to make the seam tight and impervious to air. This done, the can body is carried further along the conveyer *H* and passes under the two solder wipers *J*, which wipe off any extra solder which may adhere to the top of the seam.

### STAGGER FEED PRESS

In Fig. 2 is illustrated a press which stamps out can heads and at the same time presses them into the cupped shape which they must have in order to fit over the end of the can body. In this particular press, what is known as the "stagger feed" is applied, so that the round holes punched in the metal, being staggered, fit together much more neatly, making considerably less scrap than would be the case if the holes were not staggered. Also a pair of shears removes the flimsy scrap metal, to get it out of the way.

### HEADING WITHOUT CRIMPING

When the can bodies and heads have been made, it is necessary to put these together. By the older methods, it was customary to make the head with a slightly flaring lip, so that it would fit easily over the end of the can and then it was necessary to mash or crimp this flaring edge down against the can body, to make it reasonably tight before soldering. With modern methods, however, the accuracy of the parts is such that it is possible to put the can heads directly onto the body, without any flaring and after-crimping. This is secured by feeding the heads into recessed dies, the shoulder of which guides the can body directly into the head.

In Fig. 3 one of the heading machines is illustrated and the bodies are fed into the trough at *B*, coming down through the center of the machine, while the tops and bottoms are fed in through the narrow slots at *A A*. In the revolving part *C*, the head and bottom of the can are forced on over the body, there being numerous molds following around, one after the other, and pressing the heads and bottoms into place, so that a speed of 140 cans per minute is possible. These machines are also adjustable for various sizes, this one in particular being suitable for diameters of from 1½ in. to 4¼ in. and lengths from 1½ in. to 7 in.

### AUTOMATIC SOLDERING

As previously intimated, the next step after forcing the tops and bottoms upon the ordinary packers' can is to solder these tops and bottoms in place. This is done by the machine shown in Fig. 4, which is known as a floater. Observing this illustration, the trough *C* holds melted solder, kept hot by numerous gas flames beneath. The bottle *D* supplies a tray with acid which, of course, must first be applied to the parts. Cans coming from the header are fed into the conveyer at *A*, where they drop down to the acid tray and are rolled along on edge, slightly tipped up, so that one seam will dip and roll in the acid and then on to the tray *C*, where the can edge rolls along in a similar manner, in melted solder. The solder creeps up into the seam, following the acid and making an air-tight joint.

At the end of the solder tray the cans are dumped off, raised up in the conveyer shown above the machine, and brought back to the chute at *B*. From here they drop down and pass along the left-hand side of the conveyer, putting the other end seam of the can, first

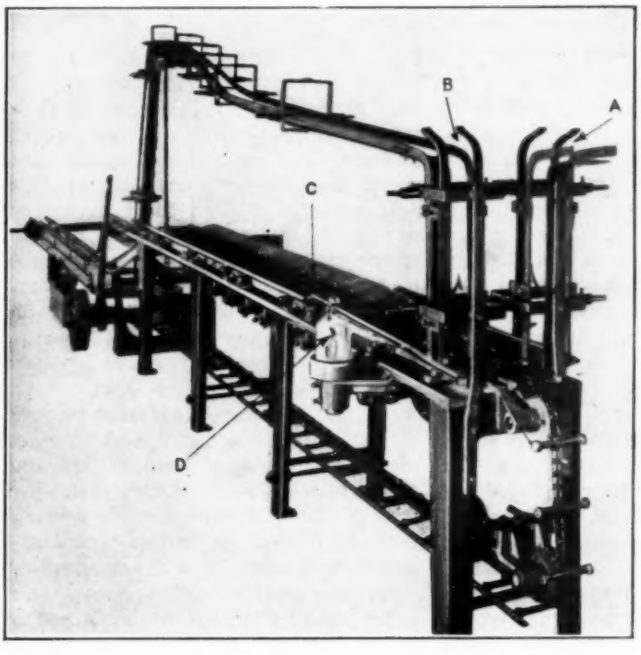



FIG. 4. AUTOMATIC FLOATER, OR HEAD-SOLDERING MACHINE

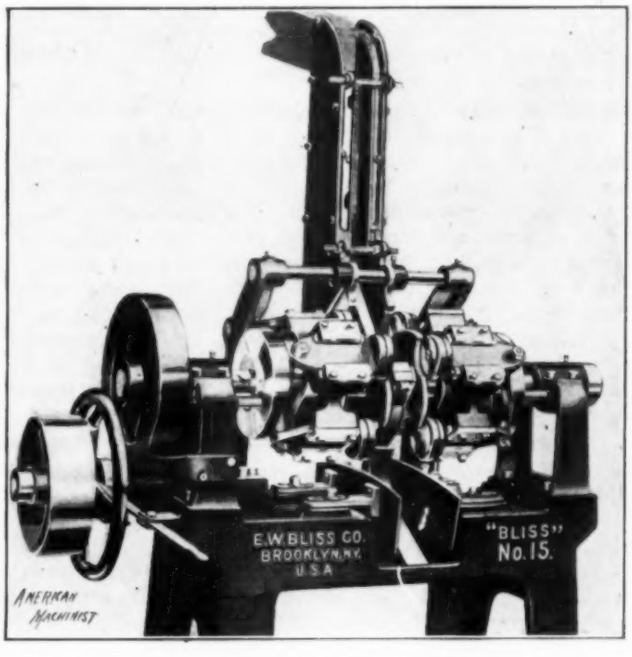



FIG. 5. AUTOMATIC ROUND-CAN FLANGER

in the acid and then in the solder, so as to seal this end as well. At the extreme end of the machine the cans are brought out upon the cooling belt, where the solder has time to harden. Provision may also be made for wiping off the excess solder. Such machines are built for a speed of 150 cans per minute and are adjustable to a wide range of sizes.

### Double Seaming Sanitary Cans

So far, we have been talking about packers', or soldered-end-seam cans. To go back to the sanitary can, it will be remembered that the end seams in these are folded over on themselves, or double-seamed, there being no solder. The first step in obtaining this double seam is to put a flange all around the can by expanding the ends of the can body, that is, flaring the ends out at about a right angle. This operation is performed on the machine shown in Fig. 5, which is continuous in operation, takes a wide range of sizes, and flanges at the rate of about 140 or more bodies per minute. The b dies are fed down through the chute shown.

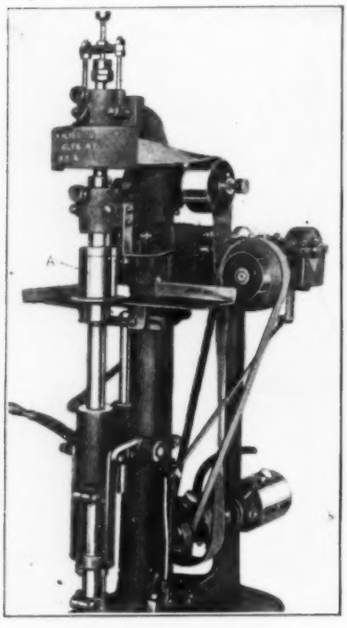


Fig. 6. Double Seamer

Before applying the bottoms, which are stamped out by the press already shown, these are passed through a machine having suitable mandrels and wheels for automatically applying the compound to fill up the seams, in the place of solder. After this, the can body, with bottom in place, is put into the machine shown in Fig. 6, which is known as the double-seamer. In this illustration, *A* represents a can body and bottom, ready for the crimping down of the seam at the end, this seam being rolled over on itself several times, by suitable rollers, as the can revolves. Of course, these open-top cans must be shipped without covers, so that when they are first made it is only the bottom which is double-seamed to the body, and the top must be double-seamed at the packing establishment, after the goods are put into the can. With such a machine, ends are double-seamed at the rate of 37 per minute.

### Hemming the Solder Caps

Fig. 7 represents what is probably the most interesting of all these can-making machines. This is known as the solder-cap hemming machine, and is used for applying solder to the edges of the small caps which are used to close up the final small opening in the top of a packers' can. In the illustration a large number of caps are shown on the table of the machine and they are fed to dies in a revolving dial plate, one die being visible at *D* and one on each side of it. Wire solder is fed from the reel and passes under the press *A*, where it is cut off and formed into a ring. It is then passed on by the revolution of the dial plate, to the presses *B* and *C*, where it is flattened out, that is, the round wire is made into a flat rim, somewhat like a narrow gasket, and formed to fit the cap.

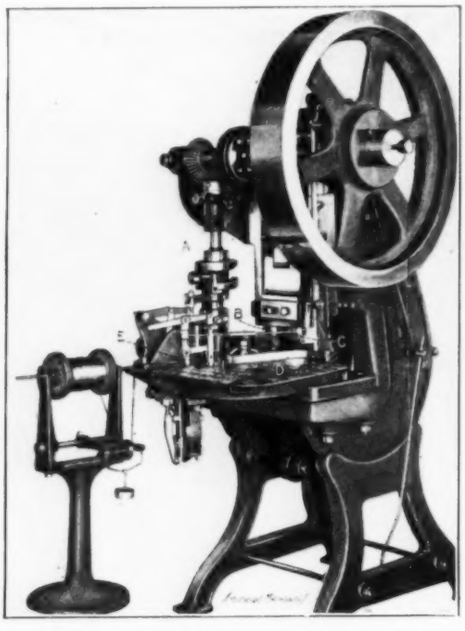


Fig. 7. Solder Cap Hemming Machine

At *D*, the operator places a cap, which is saucer shaped, on top of the solder ring and the two are then carried under the subpress *E*, where one edge of the thin, round sheet of solder is folded entirely over the edge of the cap and pressed down tight around the rim. No heat is applied, but the shape of the ring and the pressure hold it very rigidly in place on the edge of the cap. Beyond the subpress *E*, the dies automatically eject the caps with the solder in place. These caps are shipped to the packer who, after the cans have been filled, solders the caps to the tops of the cans by other special soldering machines.

### Automatic Tester

One of the most important machines is shown in Fig. 8. This is the can tester and, as its name implies, its function is to discover the imperfect or leaky cans. The very minutest opening to air is sufficient to start fermentation in canned goods and the can manufacturer is forced to guarantee to the packer that not more than two cans per thousand shall show an air leak. With this limit of error it may readily be understood that careful inspection is necessary, even with the best of machinery.

Packers' cans are fed to this testing machine from a chute coming from the floater or soldering machine, and in the case of the sanitary cans, from the double-seamer. As the cans are received they are automatically gripped between the round plates carrying rubber gaskets, and as they are carried around and dipped into the water tank beneath, air at a pressure of from 15 to 20 pounds per square inch, is applied through the center of the plates holding the cans in place. An operator at one side then carefully observes if any bubbles arise from the water, denoting a leak and if one is discovered the operator presses a trigger on the holder carrying the leaky can, so that when the wheel has revolved to a certain point, this leaky can is automatically dropped out into a chute for this purpose. The other cans, which are perfect, are not disturbed by the operator but are carried up further and automatically dropped down to another chute to carry the perfect cans.

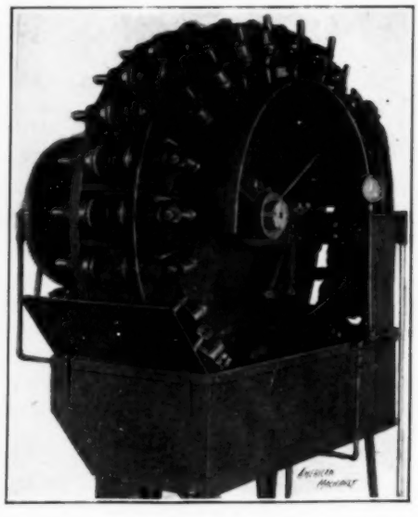


Fig. 8. Automatic Can Tester

Driving of this machine is quite slow so as to prevent stirring up the water and forming bubbles from other causes than leaks. This slow speed necessitates

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the large number of can carriers, the particular machine illustrated having 24 and having a capacity of from 50,000 to 60,000 cans in ten hours. The air pressure is applied only to those cans which are under water.

Another effort to eliminate disturbance in the water is to drive the machine by worm gearing, instead of spur, thus reducing vibration. It is said that with machines of this character retests of all the cans passed through the machine in a day have repeatedly shown not a single leaking can among those passing out through the perfect chute during this time.

It is through the courtesy of the E. W. Bliss Company, of Brooklyn, N. Y., who are the manufacturers of these machines, that we are enabled to reproduce the accompanying illustrations.

# Value and Effect of Education

By Entropy

*Some comments on the shortcomings of the present-day educational methods in general.*

*Too much schooling and a lack of genuinely practical methods.*

Much has been said about industrial education in its relations to workmen, but little about the value or lack of value of education in general.

The first effect of public-school education is to reduce the power of the parent over the child. This is most noticeable in the case of working people whose own education is poor. But with the best educated, it is staggering to have a ten year old come home and ask whether Mt. Hood is higher than Mt. Blanc, and then after one has passed snap judgment to be told their actual hights to the odd inch. If the child is not answered correctly, he immediately loses faith in his father and gains confidence in the teacher. It is but a short step to complete loss of respect for the father's knowledge, for the schools do not teach the things that the father knows and has to know to earn a living for himself and his family.

The schools teach the boys to spend money, but never how to make it. The athletic societies that in the father's days ran on a ten-cent subscription and admitted everyone to their games, today assess $3 to $5 each, and 50 cents admission and sell programs, popcorn and other things in imitation of the sports of their elders. The schools teach how to spend money on flashy dress, not how to make two pairs of overalls last a year.

### Absurdities in Teaching

And what more do they get in school? They get a taste of a dozen subjects at a time, in which the "also rans" include the "three R's." The boys learn to whittle. Can anything be imagined more absurd than a woman school teacher showing a real live boy how to whittle? They furnish them with knives made of wrought iron, like those their mothers pare potatoes with. Result: Not one boy in fifty owns a knife or knows how to cut a whip from the bushes, or how to swap. If there was anything in the little old red schoolhouse that was good education, it was the training in the comparative value of jack knives.

And yet, after all, there is something about an educated man that compels attention; something that separates him from the uneducated, even though he may be rated as a "sucker" that cannot trade horses.

### Value of Ability to Reason

That something we believe to be simply the power to think for oneself. The fact that in all the many studies which the boys wade through or skim over, there is one common element, the reasoning from the many causes to the effect, leads the pupils to the point where they can ultimately think for themselves and trace the relation between forces and their results and to take results and analyze them back to the underlying principles on which they depend.

Two reasons are to be found why the lower schools do not aid in clear thinking as they might: One, the fact that teachers actually discourage individual thinking, and the other, that what thinking is done is seldom done in the direction that the pupil's daily life will likely follow.

### Limitations of Teachers

In the first case, teachers in the lower schools generally do not know enough of common things outside their specific subjects to correlate their work to life. They are lost if they are carried off the beaten track. If they allow a pupil to think for himself, he is almost certain to get out of that track on to something in which he is interested and where the teacher is not able to follow him. Again, classes in the public schools are too large to allow of individual work, hence individual thought is repressed.

In the second case, instruction in school is given along lines that interest the teacher rather than the child. Very likely most teachers would deny this allegation, but it is nothing more than human nature if it is so, since the child has no voice in the matter and if he had, would not know for what to ask.

Lower-school training cannot be made trade training, because no one ought to prophesy into what trade or profession a boy may turn in later years. Nevertheless, every boy has to buy and sell and clothe at least himself and provide himself with food, and he must obey the laws both of the city and of nature. He must be able to write a decent letter and to make a civil request. All these things and many more of similar purport are necessary to all of us, and can just as well as not be taught at a very tender age.

### Too Much Schooling

Again, even in the lower grades, there is too much schooling and too little work. In fact, it almost seems as if the reason for the amount of schooling now given is because the boys must be kept out of mischief. Work in reasonable amounts will not hurt any boy.

I remember distinctly one Thanksgiving day when the boys in the country school I was attending were to have a hare-and-hounds race in which I was to be one of the hares. My father decided that if I needed exercise, the cellar under the barn was the proper place to get it and gave me the privilege of staying at home and cleaning out the manure. I did it because I had to, and just for spite tried to work myself sick over it. Result: At dinner time the job was all done and I had the best appetite ever for that Thanksgiving dinner.

### Absence of Homework an Evil

In the city there is little or nothing to be done about the home, so the time of the boys outside of school is practically waste. There is no chance of association of father and son at work. This is all wrong. If the classes in public schools were divided in halves and one-half only at a time came to the teachers, more could be done for each boy by individual work during half the time than now. If then, again, the boy could be put to work, not at a trade, but at some useful occupation for part of his time and his schoolwork changed so that it bore some relation to life, then we might hope to have citizens with habits of industry, a knowledge of the cost and value of a dollar, a more definite idea of what work and a trade mean, and a better respect for the trade as a life work, to say nothing of making our schools twice as effective for the same money.

# Methods in Making Transformer Coils

## Editorial Correspondence

*Some of the mechanical appliances used in the manufacture and testing of transformers.*

*How the coils are wound and permeated by the impregnating compound.*

*An interesting filter press for cleansing oil used in impregnating tanks that might suggest useful application in machine shops.*

The plant of the General Electric Company in Pittsfield, Mass., is probably the best equipped of any in this country for the manufacture and testing of transformers. A recent visit showed the multiplicity of appliances used and attention to details exercised in manufacturing and assembling the transformer parts. Other articles will deal with the foundry, a new building just reaching completion, while this article will illustrate some of the mechanical appliances used in the making of transformer coils. We are very glad to acknowledge the courtesies extended to us by C. C. Chesney, general manager of the plant, in obtaining the material upon which this article is based.

### Winding a Pancake Coil

The halftone, Fig. 1, shows the winding of a large pancake coil for a shell-type transformer. The coil is wound on a wooden form rotated by a coil-winding machine. The machine is motor driven—one end of the motor can be seen within the base—and controlled by a long treadle. Tension is put upon the conductor, or wire, as it is wound, by the frame seen directly behind the operator. Here the conductor passes between two pieces of hard fiber subjected to pressure by screws. This puts a suitable tension upon the wire, enabling it to be wound evenly and tightly. Varnished paper or varnished cambric is wound between the layers of the conductor for insulation purposes. In the illustration the operator is seen placing these strips in position. After winding, these coils are taped and clamped to hold them in position, impregnated and dried to render them moisture proof and increase the insulation.

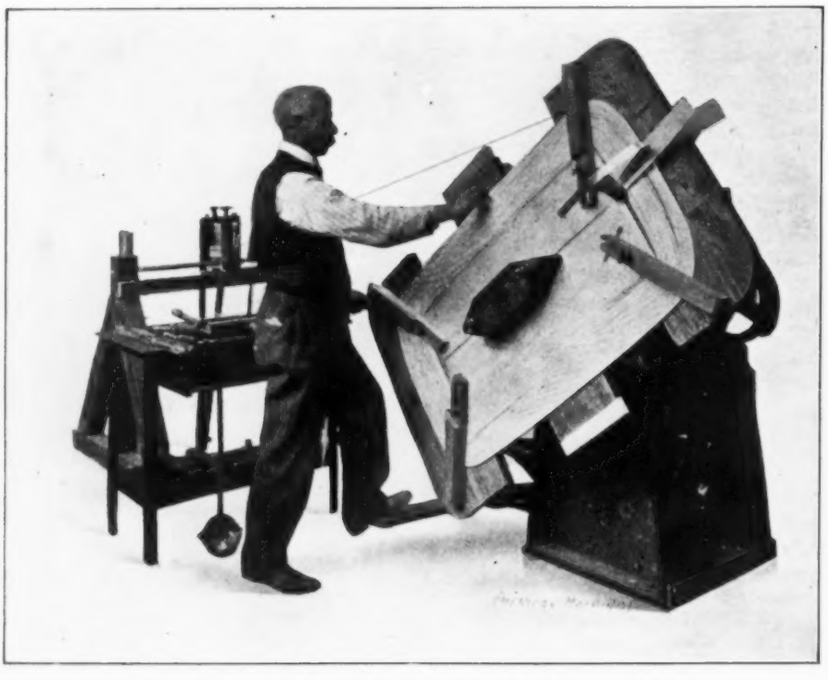


Fig. 1. Winding a Large Pancake Transformer Coil

### An Impregnating Tank

Fig. 2 shows the top of one of the impregnating tanks of which several are in use. These are large riveted sheet-steel tanks having an inner and outer shell between which steam is introduced either into the annular space or by means of coils in the space; thus the tanks are heated. The outer shell is covered with boiler covering, a non conductor of heat. In these tanks the various coils are immersed in an oil compound; the tanks are sealed by means of an hemispherical cover, and the air is exhausted. This treatment insures that all parts of the coil shall be permeated by the impregnating compound. A basket used for entering and removing the parts from the tank is seen in Fig. 2, together with the hoisting apparatus. The filter press for cleansing the oil used in these impregnating tanks is shown by Fig. 3, together with a small motor-driven pump and the controller. Furthermore, on the post above the motor can be seen one of the recording thermometers by means of which a careful record is kept of the temperature in every tank throughout the time that the tank is in use. This filter press will clean 20 gallons of oil per minute, taking out all of the dirt and suspended impurities in the oil and leaving it practically as clear and light colored as when it was new. It would appear that this device should have a wide application in the machine shop for cleaning lubricating and cutting oils. Its operation is vastly quicker than the operation of gravity filters and from the result observed with this particular press, it hardly seems as if the gravity filter has any claim of superiority as regards the degree of cleansing.

Fig. 2. Impregnating Tank

### Drying Ovens and Storeroom

The final illustrations, Figs. 4 and 5, show a steam-heated drying oven in

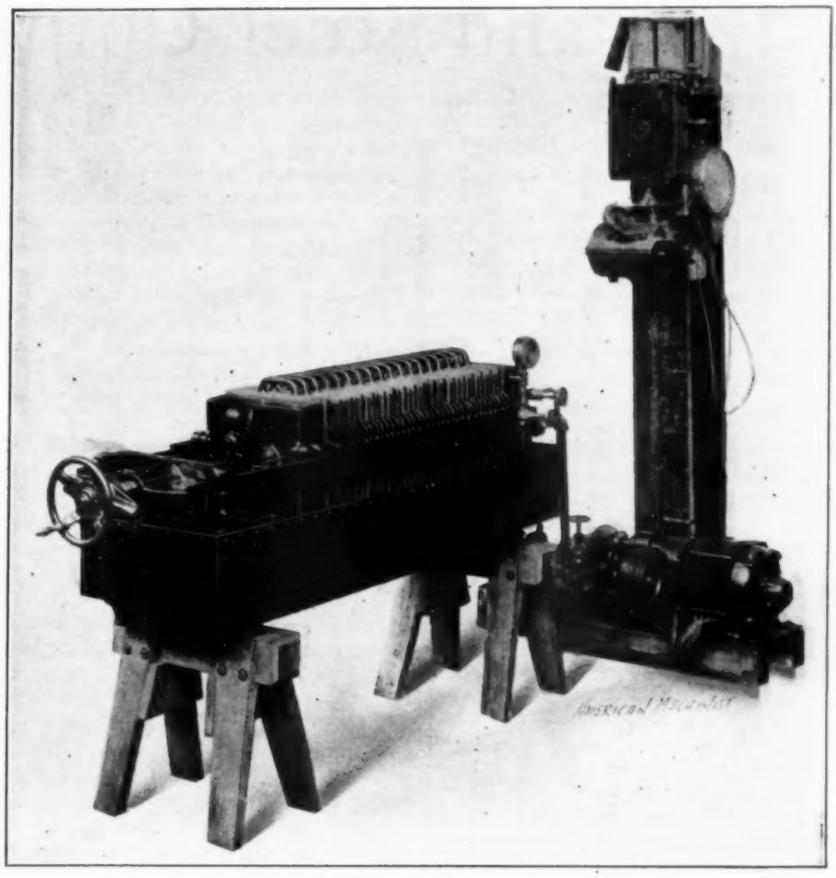


FIG. 3. FILTER PRESS FOR CLEANING OIL OF IMPREGNATING TANKS

which the coils are dried out after coming from the impregnating tank, and one of the storerooms where the coils are stored awaiting assembly. But little comment is needed. In Fig. 4, at the right can be seen a pile of pancake coils, one of which type was seen in process of winding in Fig. 1. Fig. 5 will give some idea of the complexity of the kinds and shapes of coils that are carried in stock, and is of interest for this reason and for the systematic manner in which the coils are stored.

## A Tool for Holding Headless Set Screws

BY A. W. MILLS

The cut shows a tool used for removing headless screws that have been screwed beyond the tapping.

It is made of a piece of brass tube saw cut and flattened out at one end. Two pieces of spring steel with the ends turned so as to grip in the screw slot, are riveted to each part of the tube that has been flattened.

A TOOL FOR HOLDING HEADLESS SET SCREWS

Inside of the tube is inserted a piece of ⅛-inch rod beveled at one end and with a small knob on the other. By pressing on this knob you can force the pieces of spring steel apart so as to grip the sides of the screw slot. The screw in the oil hole at the top of a transmission-gear case of an automobile had been screwed through the case and had become imbedded in the grease. This tool was inserted in the oil hole and locked in the screw slot by pressing on the knob at the end of the tube. The screw was easily removed, thereby saving several hours of time in dismembering the gear case, which would otherwise have been necessary.

FIG. 4. DRYING OVENS FOR TRANSFORMER COILS

FIG. 5. AN AISLE IN THE STORE ROOM

# Briquetting Iron and Steel Chips

By Hubert Hermanns

*A process developed in Germany for utilizing chips.*

*The chips are briquetted by submitting them to a very high pressure in a press, and experience in their use in the foundry has thus far proved quite favorable.*

For years past the problem of profitably utilizing machine-shop refuse has been subjected to painstaking, costly and thorough experiments. With the enlargement and expansion of metal-working shops, how to utilize the chips or material left after machining, has become a very important question. This often amounts to 10 per cent. of the total production and such refuse forms an undesirable by-product, as it occupies considerable space, and at least in the case of valuable material, a constant oversight of the stock-room is required.

On the other hand, there is an attempt to reduce the cost of material by utilizing these waste products in a way that will improve the qualities of materials. The most economical method of utilizing iron and steel chips is not to employ them for road making, as has often been proposed, but to mix them with material for melting in furnaces.

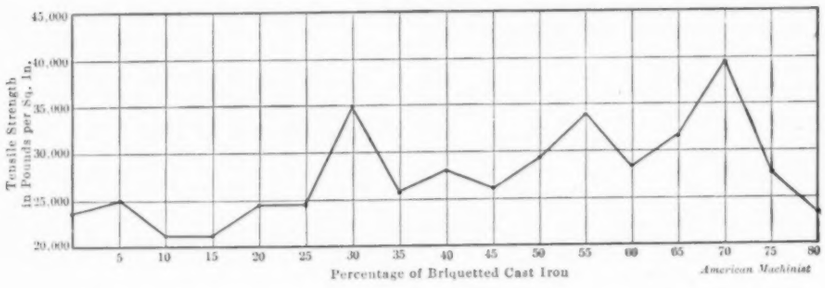



FIG. 1. MIXTURE COMPOSED OF KRAFT I PIG IRON AND BRIQUETS

The practical embodiment of this idea has given rise to serious difficulties. Were the iron chips to be thrown into the furnace loose, they would in part be driven out by the blast, and in part would be subjected to violent combustion, and pass into the slag as ferric oxide ($Fe_2O_3$). The large surface and small cross-section of the chips greatly favors their burning. Aside from the fact that a great quantity of viscous slag must be reckoned with, a loss of some 50 per cent. of the chip charge may be expected.

### SEVERAL METHODS OF PREPARING CHIPS

It is therefore needful to find a form in which the chips may be added to the charge without such a disadvantage, and this can be done by protecting them from this extensive combustion. Outerbridge, in order to give the mass of chips a compact structure, packed them first in wooden and subsequently in cast-iron boxes, which he added to the charge. This method, if not all that might be desired in its economic result, exerted a favorable influence upon the qualitative properties of the iron produced. He was thus able to employ the chips in an iron mixture of high grade. He could accomplish this, however, only at such time as the iron commanded a high price.

Melting down the chips in the furnace with a low blast has not resulted favorably; nor have the attempts to rust the chips together into large masses in the open air. In the furnace these masses become disintegrated into loose chips, and a large quantity oxidizes into the slag.

Trials have often been made to press the chips into briquets with the aid of a binder. As a rule, the binder has failed in the furnace heat, and the briquets have broken up. Aside from the fact that the binder itself is not an ingredient likely to improve the quality of the iron, this also resulted is a large loss in the weight of the chips by oxidization.

### PRESSING BRIQUETS UNDER HIGH PRESSURE

By the Ronay process, which is used in Berlin, Germany, by the High Pressure Briquetting Company, chips are briquetted by submitting them to a very high pressure in a press. This compresses them into a solid and compact mass, without using a binder. Good results are obtained in this way, as it not only utilizes the shop refuse in an economical manner, but exerts a beneficial influence upon the properties of the iron.

According to trustworthy reports from practice, these briquets are substitutes for scrap, and also enable the production of high-grade cast iron without adding to the mixture costly kinds of special iron.

### USE OF BRIQUETS

It is a well known fact that strength requirements of cast iron are becoming more and more rigorous; in order to meet the competition of the costlier cast steel, and also keep up with the increasingly exacting demands of mechanical practice. This is illustrated in marine engines, which are constantly being built lighter in weight for the same power, and in the gas-engine castings which have to stand extremely high pressures and temperatures. Notable examples of the severe strains upon material are presented by small combustion motors, used in automobiles, air-ships, etc.

Thorough experiments on using briquetted chips with melting charges have been made in recent years with important results. Thus A. Borsig, of Tegel, Germany, Hartmann, of Chemnitz, and others in producing high-grade castings employ, as mixing material briquets of cast and wrought iron and steel chips instead of expensive, specially composed foreign irons.

### MIXTURES USED

Before using the briquets, the two principal mixtures that Borsig used for high-grade castings such as locomotive cylinders, etc., with the price at which the iron was delivered in Berlin, Germany, are as follows:

NUMBER 1.

| | |
|---|---|
| 30 per cent. Koldair iron, $22.80 per ton | $6.84 |
| 30 per cent. L. O. C. iron, $22.08 per ton | 6.62 |
| 40 per cent. cylinder scrap, $16.80 per ton | 6.72 |
| Total cost of charge per ton | $20.18 |

NUMBER 2.

| | |
|---|---|
| 30 per cent. Frodair iron, $27.60 per ton | $8.28 |
| 20 per cent. Bearcliffe iron, $33.60 per ton | 6.72 |
| 30 per cent. cylinder scrap, $15.60 per ton | 4.68 |
| 20 per cent. ordinary scrap, $14.40 per ton | 2.88 |
| Total cost of charge per ton | $22.56 |

By using the chip briquets as good results were obtained with the following mixtures:

NUMBER 3.

| | |
|---|---|
| 30 per cent. Kraft I iron, $16.80 per ton | $5.04 |
| 20 per cent. briquets of cast iron, $14.40 per ton | 2.88 |
| 10 per cent briquets of steel, $14.40 per ton | 1.44 |
| 20 per cent. Kraft III iron, $15.60 per ton | 3.12 |
| 20 per cent. cylinder scrap, $15.60 per ton | 3.12 |
| Total cost of charge per ton | $15.60 |

NUMBER 4.

| | |
|---|---|
| 10 per cent German foundry I, $16.80 per ton | $1.68 |
| 20 per cent. Lubeck, 3, $15.60 per ton | 3.12 |
| 20 per cent. briquets of cast iron, $14.40 per ton | 2.88 |
| 10 per cent. briquets of steel, $14.40 per ton | 1.44 |
| 40 per cent. scrap iron, $14.40 per ton | 5.76 |
| Total cost of charge per ton | $14.88 |

By comparing the most favorable examples presented in these tables, table 4 shows the enormous saving of $7.68 per ton of charged material over the mixture in table 2. Comparing the cheaper mixture without briquets in table 1 with the

dearer briquet mixture in table 3, there is still a saving of $4.58 per ton in the charged material, which for a production of 1500 tons of cylinder iron, as in the case of Borsig, comes to a yearly saving of $6,840.

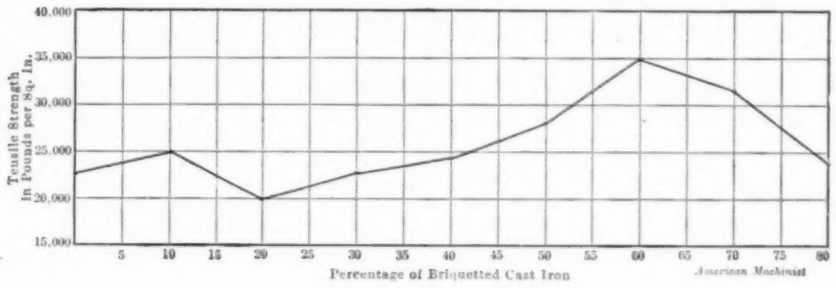



FIG. 2. MIXTURE COMPOSED OF LUBECK PIG IRON AND BRIQUETS

A large German machine works employs the following mixtures:

No. 5. In cast iron for machinery purposes, the average charge contains 11 per cent. of chip briquet with 38 per cent. of scrap iron or foundry scrap. With the iron scrap omitted, 30 per cent. of briquets are used.

For locomotive cylinders three mixtures are employed as follows:

No. 6. English and German pig iron with 12 per cent. chip briquets and 16 per cent. cylinder scrap.

No. 7. Ordinary German hematite and foundry pig iron, with 18 per cent. cylinder chip briquets and 24 per cent. of cylinder scrap.

No. 8. German pig iron high in manganese, foundry pig iron, 24 per cent. briquetted cylinder chips and 34 per cent. cylinder scrap.

No. 9. For steam cylinders. Special grades of pig iron are mixed with 12 per cent. of briquets of ordinary cast-iron chips.

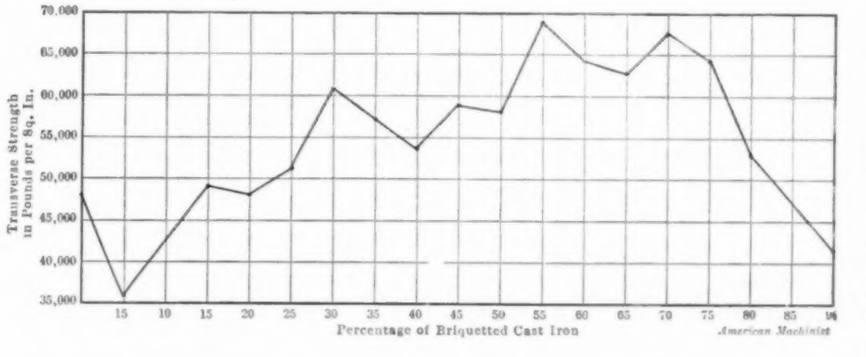



FIG. 3. MIXTURE COMPOSED OF KRAFT I PIG IRON AND BRIQUETS

No. 10. For compressor covers. Special grades of cast iron are mixed with 18 per cent. of ordinary chip briquets and 8 per cent. of wrought-iron refuse. Cylinder scrap was not added.

MECHANICAL PROPERTIES

Test pieces were cast from some of the various foregoing mixtures and these were subjected to tensile, transverse and impact strength tests.

The tensile test pieces were cast 1⅛ inches in diameter, and were turned down to 1 inch.

The transverse test pieces had a cross-section of 19/16 inches square and remained rough. The length between supports was 36 inches.

For the impact tests, bars were cast 1¾ inches square and 10 inches long and these planed on all four sides to reduce them to 1½ inches square. They were laid upon two knife-edge supports 6¼ inches apart, and subjected to a blow from a 26½-pound weight, begun with a drop of 13 inches, which increased by about 2 inches at each stroke

The increase in strength from adding briquets to the cast iron for machinery parts (No. 5) was as follows:

| | Without Briquets. | Briquetted Iron | |
|---|---|---|---|
| | | 20% | 30% |
| | Pounds per Square Inch. | | |
| Tensile strength . . . | 25,000 to 28,000 | 32,200<br>33,200 | 41,300<br>42,400 |
| Transverse strength . . . | 37,500 to 47,000 | 50,600 | 53,500 |
| | Hight of Drop in Inches. | | |
| Impact . . . . . | 13 to 16 | 20 | 22 |

In the other mixtures with the briquets added strengths were obtained as follows:

| | KIND OF TESTS. | | |
|---|---|---|---|
| | Tensile. | Transverse. | Impact. |
| Number of Mixture. | Pounds per Square Inch. | | Drop in Inches. |
| 6 . . . . . | 37,500 | 56,500 | 27.5 |
| 6 . . . . . | 35,200 | 55,400 | 20.0 |
| 7 . . . . . | 45,700 | 77,700 | 25.5 |
| 7 . . . . . | 48,500 | 76,000 | 39.4 |
| 8 . . . . . | 48,400 | 78,500 | 27.5 |
| 8 . . . . . | 45,700 | 67,500 | 29.5 |
| 9 . . . . . | 35,200 | 55,400 | 20.0 |
| 9 . . . . . | 37,500 | 56,500 | 27.5 |
| 10 . . . . . | 38,700 | 66,800 | 25.5 |
| 10 . . . . . | 39,100 | 70,000 | 27.5 |

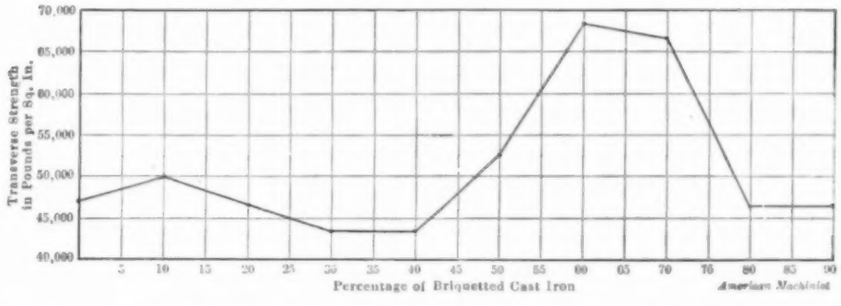



FIG. 4. MIXTURE COMPOSED OF LUBECK PIG IRON AND BRIQUETS

The machined and fractured surfaces presented a very dense appearance, which goes to explain the high figures for strength. These results would indicate that greater tensile, transverse and impact strengths can be obtained from iron castings made in this way.

Not only heavy and medium, but also thin-walled castings were made with a chip briquet mixture of 12 per cent. and over. Cylinder linings of about 40 inches diameter and ½ inch thick were readily cast, as well as castings 5/16 inch thick for textile machines.

TESTS FOR TENSILE STRENGTH

To determine the average tensile strength and arrive at the appropriate mixtures a series of tests were made and the results are tabulated in Figs. 1 and 2.

The highest tensile strength shown by the curve of the first series of tests re-

sulted from a chip mixture of 70 per cent., the remaining 30 per cent. of the charge being Kraft I pig iron. The tensile strength was nearly 40,000 pounds per square inch. From this point it fell very abruptly. With a mixture of 70 per cent. of Kraft I iron and 30 per cent. of chip briquets, the likewise favorable figure of 35,000 pounds was obtained.

According to Fig. 2 a mixture of 60 per cent. of cast-iron chip briquets and 40 per cent. of high-silicon Lübeck pig iron gave a tensile strength of 35,000 pounds per square inch.

Essentially favorable results were also obtained from the mixture: 20 per cent. steel briquets, 20 per cent. cast-iron briquets and 60 per cent. hematite Krupp. The tensile strength of this mixture being 43,000 pounds per square inch.

For the mixture: 25 per cent. steel briquets, 25 per cent. cast-iron briquets, and 50 per cent. hematite Krupp, the tensile strength fell off a little, it being 42,300 pounds per square inch. This was the most favorable result in regard to tensile strength the series of tests furnished.

### Tests for Transverse Strength

In Figs. 3 and 4 are tabulated the results of transverse strength tests.

In Fig. 3, with 70 per cent. cast-iron briquets and 30 per cent. Kraft I pig iron a transverse strength of 66,500 pounds per square inch was obtained, while with 55 and 45 per cent. respectively, it was 69,000 pounds. With 30 per cent. cast-iron briquets and 70 per cent. Kraft I pig iron the transverse strength was 60,300 pounds per square inch.

The transverse strength in the series of tests shown by Fig. 4 for 60 per cent. cast-iron briquets and 40 per cent. high-silicon Lübeck pig iron, amounted to 68,000 pounds per square inch, and with 60 and 40 per cent. respectively, this was 69,000 pounds.

With a mixture of 20 per cent. steel briquets, 20 per cent. cast-iron briquets and 60 per cent. hematite Krupp, the transverse strength was 54,600 pounds per square inch.

For a composition of 25 per cent. steel briquets, 25 per cent. cast-iron briquets, and 50 per cent. hematite Krupp, the transverse strength rose to 65,000 pounds per square inch.

### Analysis of Briquets

A trial was made by melting about 3300 pounds of briquets alone. The oxidization amounted to about 10 per cent. and the result was a white iron. For a mixture of about 20 per cent. of pig iron with 80 per cent. of briquetted chips, the oxidization fell to the normal rate of about 4 per cent. Therefore, the employment of cast-iron briquets does not entail an especially high loss. The chemical analyses of the pure briquets before and after melting were as follows:

The briquets before melting. Silicon 2.51 per cent. Sulphur, 0.105 per cent., manganese, 0.33 per cent., phosphorus, 0.50 per cent., graphitic carbon, 2.68 per cent., combined carbon, 0.92 per cent.

The melted product: Silicon, 1.27 per cent., sulphur, 0.19 per cent., manganese, 0.50 per cent., phosphorus, 0.44 per cent., graphitic carbon, 2.08 per cent., combined carbon, 0.96 per cent.

Of note is the considerable removal of the silicon, while a not unimportant enrichment with manganese has taken place.

### Effect of Briquets on the Metal

As appears from Figs. 1 to 4, the effect of the briquets in the charge is essentially to increase the tensile and transverse strength by reducing the quantity of carbon. Because of their compact mass, as compared with loose chips, the briquets are protected from strong oxidization in their upper melting zones and against slagging, and in comparison with pig iron, they have a more or less porous structure. Thus part of the graphitic carbon present in the briquet is consumed above the melting zone. An enrichment with carbon may take place during the melting but this does not suffice to make up completely for the carbon that has been lost, and the results are a considerable lessening of the total carbon contained.

In steel foundries chip briquets may serve as a substitute for the low-phosphorus white iron that is largely used. In fact, they can be economically used in any place where steel scrap is used, whether it be in the foundry or the steel mill, as briquets of steel or wrought-iron chips are a good charging material

In one steel mill, 11 tons of briquets, charged in place of the same quantity of loose chips, effected a saving of 33 minutes in the charging time and 3 men's labor was dispensed with. The briquets in this case weighed from 17 to 22 pounds, but if larger briquets were used the saving would probably have been greater.

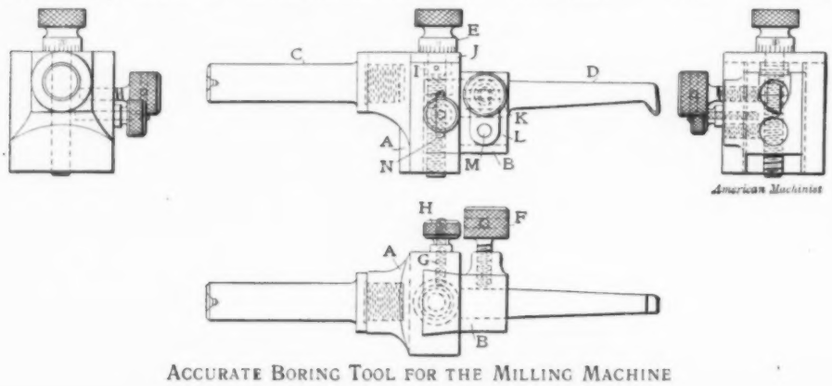
Chips from hard rolls, projectiles, etc., may be so mixed with gray-iron chips, as to make a uniform charging material. Chips from copper, brass, bronze, white metal, etc., have also been briquetted with pressure and a saving effected. This is due to the fact that the cost of pressing the chips into briquets is much less than the savings that are effected in many other ways, such as the lesser oxidization of the metal in remelting the easier methods employed to handle the chips, the less space required for their storage, etc.

# Accurate Boring Tool for the Miller

## By Wm. M. Mitchell

The accompanying sketch shows a tool that has proved a time saver in boring holes from ⅛ inch to 2¾ inches, advancing by thousandths if desired.

The tool consists of body *A* which is dovetailed to allow tool holder *B* to be adjusted by means of micrometer screw *E*. This screw is held by collar *I* in plate *J*, which is fastened to body *A*. It is screwed into *B* and provided with locknut *H*. Slot *N* is to allow the stud to move with holder *B*. Tool *D* is shown inserted in hole *K* and held by screw *F*.




Accurate Boring Tool for the Milling Machine

For boring large holes, place tool *D* in hole *L* and transfer screw *F* to tapped hole *M*. For boring small holes, a smaller tool should be placed in hole *K*.

The tool holder is held in a chuck or spring collet by means of shank *C*, which is screwed into body *A*. All parts of the device are made of tool steel, and it is strong and rigid.

In a paper on compensation for accidents presented before the Railway Claims Association the following conclusion was made: "We repair or replace broken or worn out machinery. Why should we not, in part at least, alleviate the suffering and the want of those who toil for the good of society by requiring that society to bear its fair share of the burden?"

# Making the Schebler Carbureter

## Editorial Correspondence

*In the manufacture of this carbureter several interesting fixtures and tools are used.*

*Two specially designed screw-machine tools accomplish excellent results, and extremely accurate methods are followed in making some of the parts.*

The latest design of the Schebler carbureter has a water jacket on one side of the gasolene chamber through which water from the radiators can be passed to assist in vaporizing the gasolene. As the walls are very thin, this makes a difficult casting, and the method of molding and core setting is interesting.

Metal patterns are used on a matchboard, as shown at the right in Fig. 1, and projecting core prints are plainly seen. The hold is shown ready to be put together, except that the main core has not been set in the carbureter at the left. Cores *A* and *B* are set in the cope as is also the small anchoring core *C*. This fits over the small projecting core print *H* and supports this end of the water jacket core while the other corner rests on the small core *A* or *B*, both together supporting it against the flow of the metal and insuring an even wall between the water jacket and the body of the carbureter.

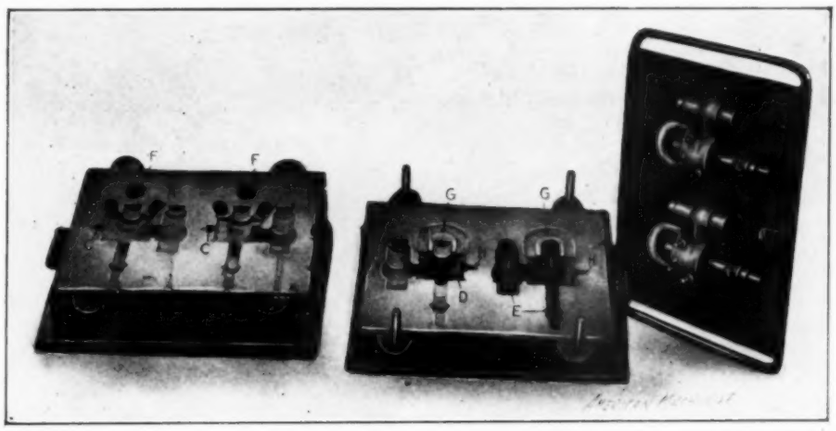



FIG. 1. MOLDS AND CORES OF BODY

The main core is shown in place at *E* and all that remains is the setting of the similar core in the other mold. Opening *F F* and gate *G G* show how the metal flows through the body casting.

### DRILLING FIXTURES

A few of the interesting drilling fixtures used are shown in Figs. 2 and 3. Referring to Fig. 2, we have at the left a fixture for drilling a small side hole in the body of the carbureter. The body casting is located by the screw plug *A* being screwed into the opening *B* in the body shown beside the gate. It is located the other way by the central projections resting on the body of the fixture, as is shown.

Next to this is an interesting jig for drilling three holes shown in the upper flange of the casting, which is about to be lowered into the fixture. In order that these holes may bear a definite relation to the projection *E*, this is guided by the beam lot *F*, and when the piece is lowered into place it is held by the lever *G* being swung into the slot over the end of the flange. The guiding plate for the drill *H* is then slipped over the central *D* and located by a dowel pin which brings the holes in their correct position. This guiding plate is held in position by a wedge or key, which goes through the slot shown in *D*. Another view of this piece is shown at *I*.

On some of these bodies a hole is drilled behind the projection *K* and at an angle to it. The body is pushed into the fixture until the projecting outlet *B* is located by the beam lot *M*. At the same time the central opening *J* slips over the projection in the base and nozzle *K* under a cup center, which is controlled by a spring and the cam lever *N*. This locks it securely in place, and the piece *L* carrying the hardened bushing, drops into place and locates the correct position of the hole.

Fig. 3 shows two different types of jigs, the one at the left requiring practically no explanation, as it can be readily seen that the two holding jaws locate the flange and hold it while being drilled from above.

At the right is a jig for drilling the opening *A*. This is centered between two

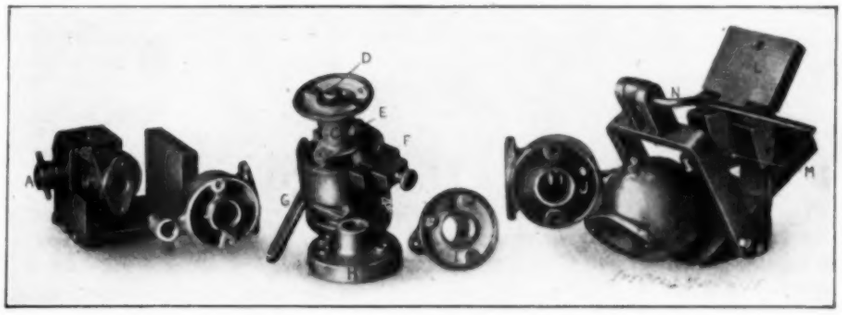



FIG. 2. DRILLING FIXTURES FOR BODY

FIG. 3. ANOTHER TYPE OF DRILLING FIXTURE

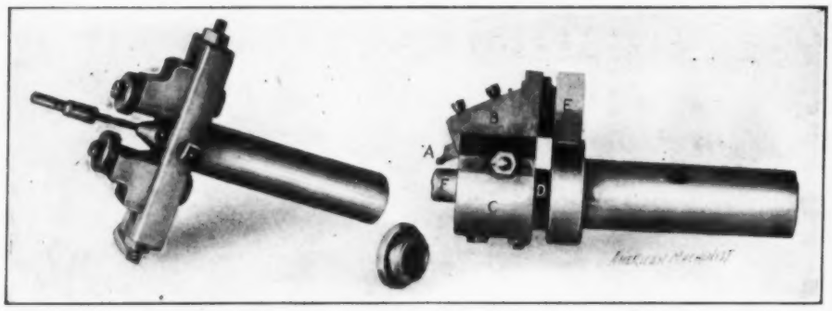


FIG. 4. TWO SCREW-MACHINE TOOLS

jaws similar to those shown in the other fixture and the body is held in place by the action of the projecting cam on the end of the lever. The work is released by the coil spring, as the lever is released.

### TWO INTERESTING SCREW MACHINE TOOLS

These interesting little tools are designed by F. V. Hughes, in charge of the screw-machine department. The tool at the left is a combination drilling and nurling tool for the small piece shown in place on the end of the drill. This resembles a small box chuck with a nurl on each jaw and a small drill chuck in the center.

At the right is a tool which not only recesses the head of the cap shown, but also cuts below the thread to allow the die to pass over readily and also to aid in holding a cork washer for making a tight joint. The cutting tool *A* is held in the swinging arm *B*, which is pivoted in the piece *C*. This piece slides on the projection of the shank, and when the point *F* strikes the inside of the cap it forces *C* back on *D* and an adjustable stop screw in the upper end of *B* strikes *E* and swings the arm *B* so as to force the cutting tool *A* down into the work. Both of these tools are used in the National Acme screw machine, on which the pieces are made.

### USING WATCHMAKERS' LATHES

The making of these carbureters requires extreme accuracy, particularly in the valve and the parts which compose it. The valve stem carries a small brass ball about 3/16 inch in diameter, which are bought in quantity from a maker who specializes this product. These require drilling and reaming to fit the valve stem and a small American Watch Tool Company's lathe is used for this purpose.

The balls are held in a draw-in chuck, the center is spotted by the small lathe tool shown, and the hole drilled with the two drills shown on the tailstock. These are mounted in a double drill chuck which is swiveled at the back end. This allows either drill to be easily swung into position at will and it is then forced into the work by the lever shown.

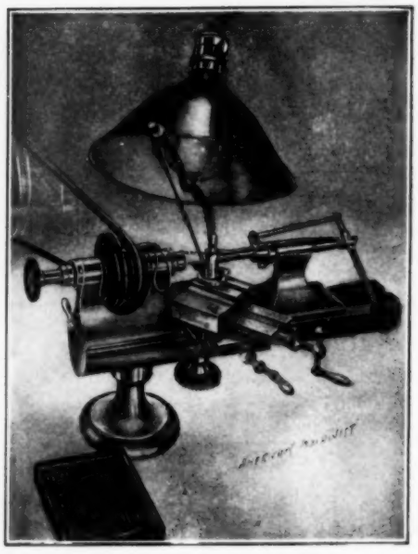


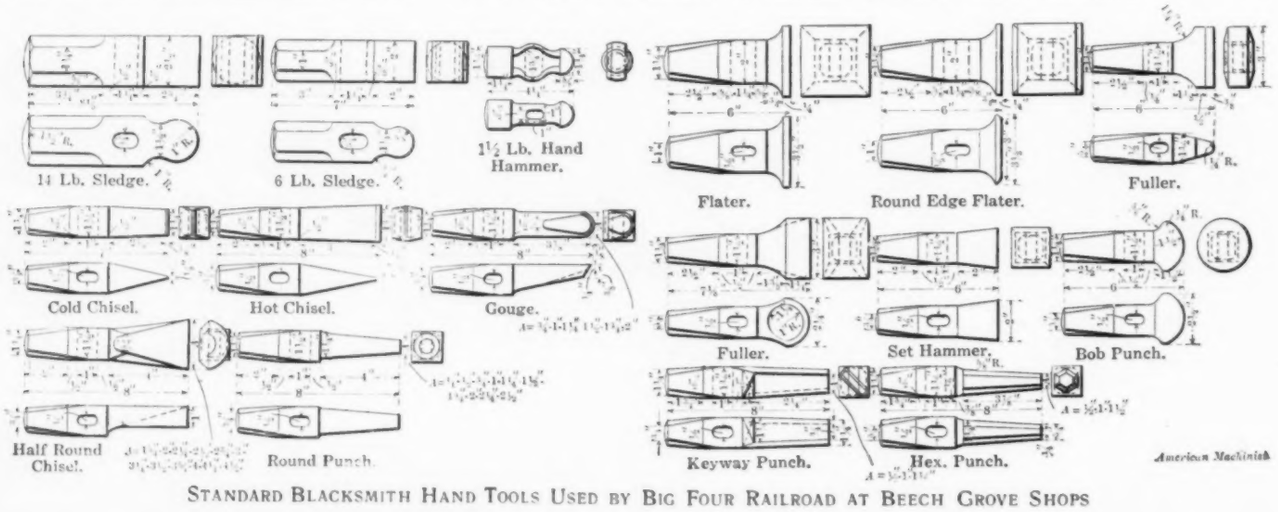
FIG. 5. WATCHMAKERS' LATHE AND LIGHT

The lamp stand shown behind the lathe is rather interesting and unusual. It consists of a 3/8-inch bessemer rod, which is bent as shown and fastened to the bench at the lower end. It carries a crosspiece which supports the lower side of the shade, while the upper edge is fastened by the collar shown. This throws the light in exactly the right position and holds it firmly, so that the light is always on the work. Two of these watchmakers' lathes are used in this work.

# Standard Blacksmiths' Hand Tools

The accompanying illustration is reproduced from blueprints supplied by the Beech Grove shops of the Big Four division of the New York Central lines, and shows the standard hand tools supplied blacksmiths on that road. Each tool bears its proper name as applied in these shops, and all necessary dimensions are given so that anyone can make any or all of these as may be desired.

While designed especially for railroad requirements, they will be found of equal value in other shops, and it must not be forgotten that the average railroad blacksmith shop probably handles a larger and more complicated variety of work than is usually found elsewhere.




STANDARD BLACKSMITH HAND TOOLS USED BY BIG FOUR RAILROAD AT BEECH GROVE SHOPS

# Precision in Instrument Making

## Editorial Correspondence

*Some examples and methods of extreme accuracy in measurement and division used in the manufacture of standard scientific instruments.*

Those who have gone deeply into the matter of careful and precise measurement are fully alive to the fact that there is no such thing as absolute accuracy of measurement. There are, however, certain people who are engaged in the manufacture of products such as standard scales, engineers' transits and astronomical and mathematical instruments, whose work calls for accuracy of measurement far beyond that of ordinary manufacture. In the accompanying illustrations there are shown some interesting measuring and dividing devices in the establishment of W. & L. E. Gurley, of Troy, N. Y., all of which were built upon the premises. The accuracy of the products turned out by these machines can be gaged only with a micrometer microscope.

In Figs. 1 and 2 is illustrated an automatic machine for dividing what is known as the "limb" of an engineer's transit. The limb is that part of the transit upon which is laid out a complete circle divided in fractions of degrees. There is also a vernier on the transit, which makes it possible to read to fractions of a minute. It is by means of this graduated circle that the lines of a survey are determined and engineering work laid out with a transit. Considering the comparatively great length of these survey lines, it will be appreciated that an inaccuracy in the graduation of the transit limb, giving even a slight inaccuracy in the angle of the telescope, might result in a very material discrepancy at the further end of the line. This being the case, it is very essential that the dividing of this limb shall be done with the extreme of accuracy.

### Accuracy as a Profession

The machines illustrated were designed and built by E. W. Arms, who has made this a life study and is in charge of this department in the Gurley establishment. The machine which he built previous to the one illustrated was found by actual measurement to be accurate within 1.8 seconds of arc at the worst point. This measurement was obtained on the rim of a 36-inch wheel and it will be well to notice that on such a circle, one second of arc would amount to a distance of 0.00008727 inch. From this we have that 1.8 seconds is equal to 0.000157 inch.

This was some years ago, and was then considered a marvel of accuracy. At the time of the Chicago exposition, however, other machines were gotten out by other manufacturers, which, strange to say, had exactly the same limit of error. Not wishing to be outdone and again desiring to have what he had previously been acknowledged to have, that is, the most accurate dividing machine in the world, Mr. Arms set out to make a new machine, that is, the one illustrated in Figs. 1 and 2. The accuracy of this machine has never been definitely determined, because the error seems to be too small to measure.

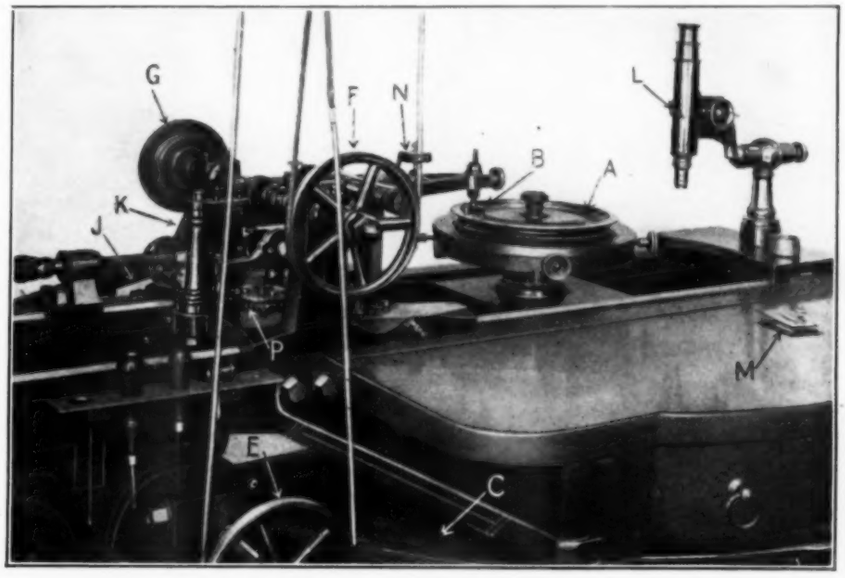



Fig. 2. Rear of Circular Dividing Machine

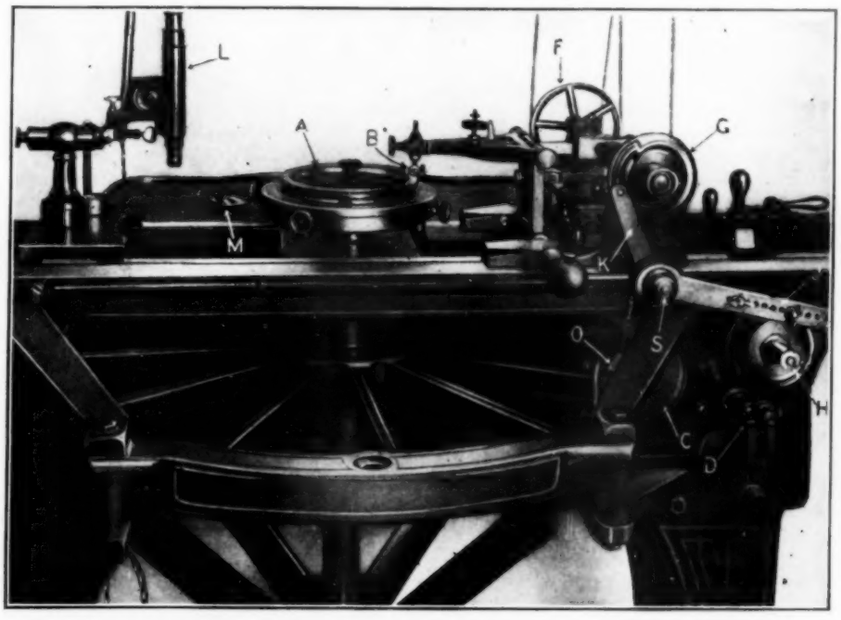



Fig. 1. Front View of Circular Dividing Machine

### Operation of the Machine

Before describing the method by which the extremely accurate division is obtained, it will be well to say a few words about the operation of the machine in question. In Figs. 1 and 2, the reference letters are the same for the same parts. Referring to these figures, power is applied to the machine in two places, that is, on the grooved wheels *F* and *E*, and these serve to operate two escapement mechanisms, so designed that only

one of these wheels can turn at a time. On the ends of the shafts opposite to the belt wheels, will be seen the cam disks *G* and *H* and between these two are the levers *J* and *K*, which are rigidly fastened together and swing on *S*.

In each of the cams, *G* and *H*, there is a slot leaving a sharp, right-angle turn, and in these slots travel two pins, one on the end of lever *K* and one on end of lever *J*. The action of these slots and pins is such that when one cam is stopped by the pin catching in the right-angle turn, the pin on the other lever is released from the right-angle turn of the other cam, so that the latter makes one revolution. When, in turn, this cam is stopped by the right-angle turn, this releases the former cam, which in its turn makes one revolution while the other one remains stationary. The disk *G* is mounted upon a shaft carrying suitable cams to move the cutting head, carrying the tool *B*, which engraves the straight division marks upon the circular rim of the transit limb *A*. The disk *H* is geared to the shaft *D* and upon this shaft there is a worm which engages the large worm wheel *C*, carrying the work *A*. One rotation of the cam wheel *H* rotates the shaft *D* a number of turns, turning *C* a distance depending upon the ratio of the gearing between *H* and *D*. Thus, alternately, a line is engraved and then the wheel and work are turned to the next position, where another division mark is engraved.

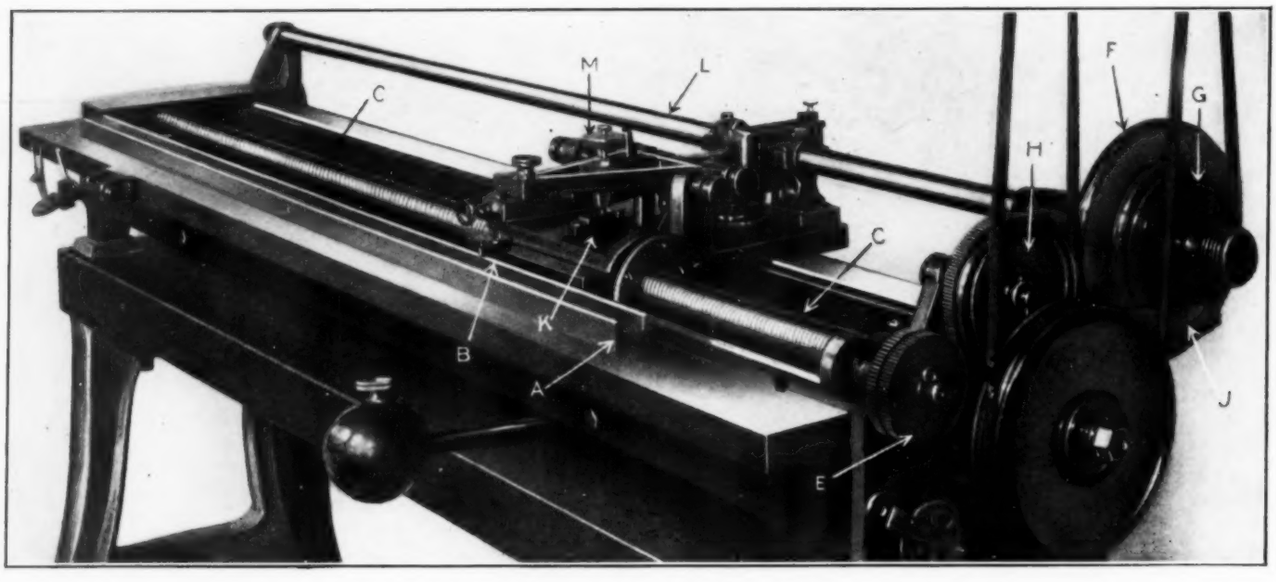



FIG. 3. THE STANDARD SCALE DIVIDING MACHINE

### LAYING OUT WITH THE MICROMETER-MICROSCOPE

From this description it will be seen that the entire accuracy of the machine depends upon the accuracy with which the teeth are cut in the worm wheel *C*. The worm on the shaft *D* need not be so accurate as the wheel, because the machine is so designed that the worm makes an even number of revolutions for the usual division marks for which it is used.

As may be imagined, the process of cutting the teeth in the wheel *C* is a long and tedious one. First, the wheel is put into a circular dividing machine of such accuracy as may be convenient, and division marks put around the upper face of the rim, one division mark for every ten minutes of arc. This brings the division marks not far from 1/16 inch apart and there will, of course, be 2160 of these marks in the complete circumference. These marks are by no means accurate in terms of what the machine itself is designed to do when it is finished, but they are used only as reference points. The next step is to calibrate these reference points.

Around the circumference of the wheel, but resting upon the frame of the machine, were placed four micrometer microscopes; one division mark on the wheel was selected as a zero point and the cross hairs of one of the microscopes were focused exactly upon this mark. Directly opposite this mark, the cross hairs of one of the other microscopes were focused upon the division mark which should be exactly opposite the first, or zero mark.

This done, the entire wheel was rotated one-half revolution, so as to bring the selected marks under the opposite microscopes; that is, the zero mark would now be under the 180-degree microscope and the 180-degree mark would be under the zero microscope. One microscope is used as the absolute reference point, and, bringing the wheel so that the 180-degree mark is exactly under the cross hair of the zero microscope, it was found that the original zero mark did not exactly coincide with the cross hairs of the 180-degree microscope. This meant, of course, that the zero and 180-degree mark on the wheel were not exactly opposite each other. The amount of discrepancy was measured by means of the micrometer microscope and half this discrepancy was called the error of the 180-degree point. The 180-degree microscope was then moved the distance of this error, or one-half the discrepancy and that was called the exact position of the 180-degree point as it should be. The wheel was then reversed again and again until the absolute positions were determined and calibrated.

### CORRECTION FACTORS FOR EACH DIVISION

During all this operation, the discrepancies of the actual positions of the marks upon the wheel were tabulated, as, of course, the marks themselves could not be moved, simply the errors were noted. The zero and 180-deg. points being thus absolutely determined and calibrated, the 90- and 270-degree points were obtained from these by turning 90 degrees, reversing the wheel 180 degrees, etc., until four microscopes could be located exactly 90 degrees apart and the errors of these four different division marks on the wheel were definitely and accurately known with reference to these microscopes.

These four points being determined, further subdivisions were made in a similar way, always keeping the microscopes as reference points and figuring from the actual measured and tabulated discrepancies of the marks upon the wheel. By continued division and subdivision, the whole 2160 marks upon the wheel were accurately calibrated; that is, their errors from exact position were

tabulated in figures, the marks themselves not being touched.

### Cutting the Worm-wheel Teeth

The next step was to mount upon a shaft, similar to the shaft *D*, a milling cutter designed to cut one tooth in the rim of the wheel *C*, at such an angle as to fit a worm which later would be placed upon the shaft *D*. As a matter of fact, the teeth upon the wheel *C* are not true worm teeth; they are merely grooves cut in the metal at an angle, so that the thread of the worm will turn in it. Spring pressure is applied behind the worm to hold it closely in mesh, so that there is no back lash. The cutter shaft was, of course, canted to give the desired angle of cut. Now being entirely calibrated, the wheel was turned so that the proper correction can be made. As said, the machine previously built had a maximum error of 1.8 second. This was determined by repeating the process of division and subdivision, turning the wheel from one microscope to another, after the teeth were cut.

When the machine is in operation and either one of the cams *G* or *H* is locked in a stationary position, the driving belts simply slip on the wheels. There is no clutch mechanism to throw this power on and off. The absence of the clutch not only makes the machine much simpler, but the belt pull, being always in the same direction, has a further tendency to eliminate any possible back lash, although, as said before, the spring tension on the worm practically does away with this.

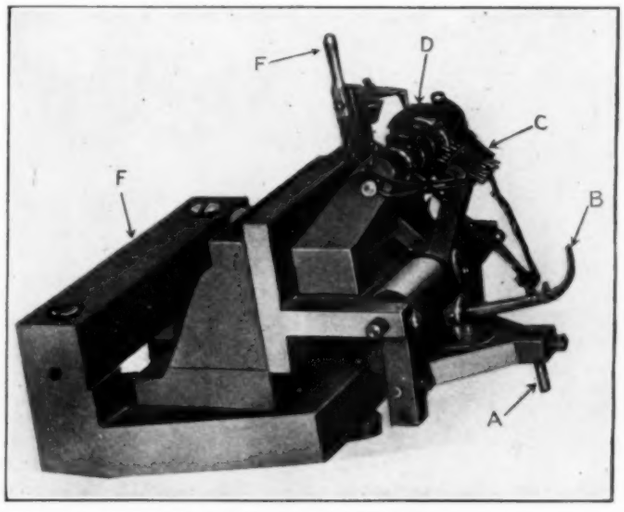



Fig. 4. Engraving Head

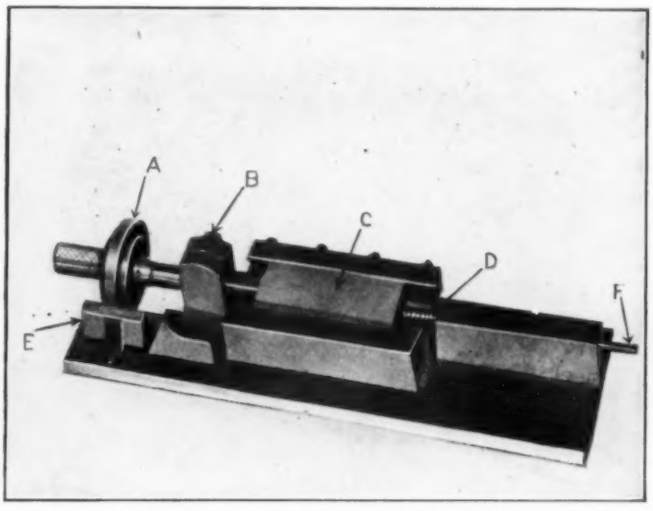



Fig. 5. A Converted Commercial Micrometer

the zero division mark came exactly under the zero microscope. This done, the wheel would be clamped as delicately as possible and the cutter shaft pushed forward to cut a groove for a tooth in the rim of *C*. The cutter was then backed out and the wheel rotated by hand to some other division point, this being determined by the microscope and the tabulated correction for that mark upon the wheel. The cutter was then again pushed forward, cutting another tooth groove in the rim of *C* and this process was continued until the complete number of teeth, namely, 2160, were cut in the rim of the wheel, each one of these teeth being located by means of the tabulated correction referring to each particular mark upon the rim of *C*.

It will thus be seen that the construction of such a machine as this could well stretch into many months of time, and after it is all done, it is even then possible, by means of the micrometer microscope, to detect a minute error, again proving that there is nothing absolutely accurate in the world. The best that can be done is to calibrate the error so that

The micrometer microscope *L* is used for centering the work *A* upon the spindle. It will be appreciated that when such great accuracy of division is required, the disk *A* must rotate exactly about its center. In using the word "exactly," this must be modified to mean as nearly as human possibilities will allow, the microscope *L* assisting by noting the minute deflection of the rim of *A* as it revolves under the cross hairs in *L*. Centering screws in the table holding *A* are provided for this adjustment. The shaft of the wheel *C* is in cone bearings, so that there will be no variation there.

### A Straight-line Dividing Machine

In Fig. 3 will be seen the dividing machine for making standard scales. The standard scale is a very carefully made, calibrated scale, cut on special metal as nearly exact as possible, as compared with the standard in the International Bureau of Standards in Europe, or that kept in Washington. Even these "standards" are not standard, but each division mark has its calibration, showing the error of its location with reference to the position in which it ought to be.

It will be noted by examining Fig. 3 that the cross section of this standard scale *A*, is in the shape of a letter H. It is upon the face of the cross piece of the "H" that the scale is engraved in such fine divisions that it is scarcely discernible to the naked eye. This cross-piece is a little below the center of the scale, so that its upper face, upon which the divisions are engraved, is at the neutral axis. This being so, a slight deflection of the scale, due to its weight, will stretch the actual divided surface as little as possible, as of course the outermost parts of the scale will stretch in bending, while the neutral axis will bend only without stretch. Furthermore, these scales are engraved for a certain temperature, usually 0 deg. Centigrade, or the freezing point, and their correction factors for temperature are determined and supplied with each scale.

### Operation of the Machine

Operation of the machine illustrated in Fig. 3 is somewhat similar to that in Figs. 1 and 2, that is, as far as the escapement mechanism is concerned. The cam disks *G* and *H* and the lever *J*, with the belt wheels *D* and *F*, operate in the same manner, while the motion imparted is delivered to the shaft *L* and screw *C*. The relative speeds of the shaft and screw are determined by the speed gearing *E*.

Screw *C* is cut with the very highest degree of skill and accuracy possible at the present day, being the result of many attempts on the part of several manufacturers. In this case, unlike the worm in the circular dividing machine, the pitch of the thread and the lead must not only be as nearly absolutely accurate as possible, but this must be true for all points in the circumference of the thread. This is because the screw *C* must be used for any unit of division and so must be stopped at any point in its revolution, be-

ing just as accurate there as at every other point in both circumference and length.

Shaft *L* operates the cam mechanism to move the various levers and heads controlling the engraving tool *B*. To divide a scale, the gearing *E* is arranged so that the screw *C* will rotate a given number of revolutions between the engraving marks put on by *B*, through the rotation of *L*. *C* and *L* move alternately, one at a time.

Screw *C* pushes the cutting head *K* along the ways by means of a special nut. By "special" is meant that provision is made so that this nut automatically corrects for temperature changes. It will easily be understood that the temperature of the room where the work is done, never being at zero degrees, the standard temperature, the scale must be divided at the existing temperature and the gearing *E*, together with the compensating device, must bring the divisions at such intervals that they will be as nearly accurate as possible, when the temperature is reduced to zero.

### Temperature Compensation

The compensating device is a metal straight-edge fastened in the bottom of the bed of the machine at a certain angle, which is adjustable. There is a pin extending down from the bottom of the nut, which rests upon the side of this straight-edge; therefore as the screw *C* is rotated and the head *K* travels along the machine, the angularity of this straight-edge causes the nut to rotate slightly, relative to the bed of the machine. Thus, if the temperature is such that with a given number of revolutions of the screw *C*, the division marks will be too far apart, the angularity of the straight-edge is made such that the nut will be rotated backward a certain small amount, to counteract for this extra length. In this way the nut does not travel as far as the screw thread would cause it to travel, were it not for this compensating straight-edge and pin. When this is done, and the engraving is completed, the scale still has to be calibrated with reference to a standard scale whose calibrations are known, and each scale is sold with a complete table of calibrations for each division mark, for a given known temperature, together with the correction factor for other temperatures

### Tool Details

In Fig. 4 is illustrated an engraving head for very accurate cutting of division marks. The diamond-pointed tool is at *A* and swings in heavy arms and links so that its motion is extremely positive. The lever *B* allows the tool *A* to drop down upon the work and the motion of the lever *E*, to the right, moves the tool *A* to engrave the line. A ratchet moves the disk *D*, in which are pockets into which drop the screws on the face of the block *C*, the adjustment of these screws being such as to control the motion of the tool in longer and shorter strokes, corresponding to major and minor division points. This cutting head is illustrated mainly to show the extremely rigid construction which is adopted to obtain the great accuracy necessary. As a matter of fact, the levers *B* and *E* are not touched by hand, but are pulled by threads so as to leave the apparatus, as nearly as possible, free from outside strain.

### The Commercial Micrometer Put to Shame

In Fig. 5 is illustrated a small dividing device constructed from a commercial micrometer head. It is usually considered that commercial micrometers are fairly accurate, but the one selected for this device was one of 28 tried, and this was the only one of that number which was found to be sufficiently accurate for the purpose. Further, this particular micrometer head was found to be sufficiently accurate only between the divisions 5 and 15 millimeters. The other divisions were useless for the purpose desired. Beyond this also, the block *E*, which acts as an index for the main divisions on the head *A*, is put on in a slanting position so as to act in the same manner as the compensating straight-edge already described for the straight-line machine.

### Pantograph Engravers

Fig. 6, while not an instrument of precision, is interesting on account of its heavy and rigid construction and yet delicacy of the work which it does. This machine is for engraving the figure numbers upon the transit limb already spoken of in connection with the circular dividing machine. These division numbers are cut with a diamond tool by the pantograph device shown in Fig. 6. In this figure the disk *C*, which rotates upon its axis, has engraved upon it the various figures and letters which are used on these limbs. By means of divisions in the periphery also, this disk may be stopped at any point by the latch *F*. When held in this position, bringing the desired figure or letter inside of the guide *E*, the operator places the guiding point *D* in the engraved letter or figure on *C*, and follows out the outline of this figure. The diamond-pointed tool *B* reproduces the same figure, reduced in the ratio of the arms of the pantograph, upon the work *A*. The whole pantograph also swings upward around an axis at *X*, the counterweights *H* acting to balance the weight of the pantograph, so that it is very easily handled. As said, this pantograph is only to put on the lettering and figures, as the division marks are engraved by the machine illustrated in Figs. 1 and 2. None of the letters or figures appearing on these instruments are stamped. They are all engraved with a diamond-pointed tool.

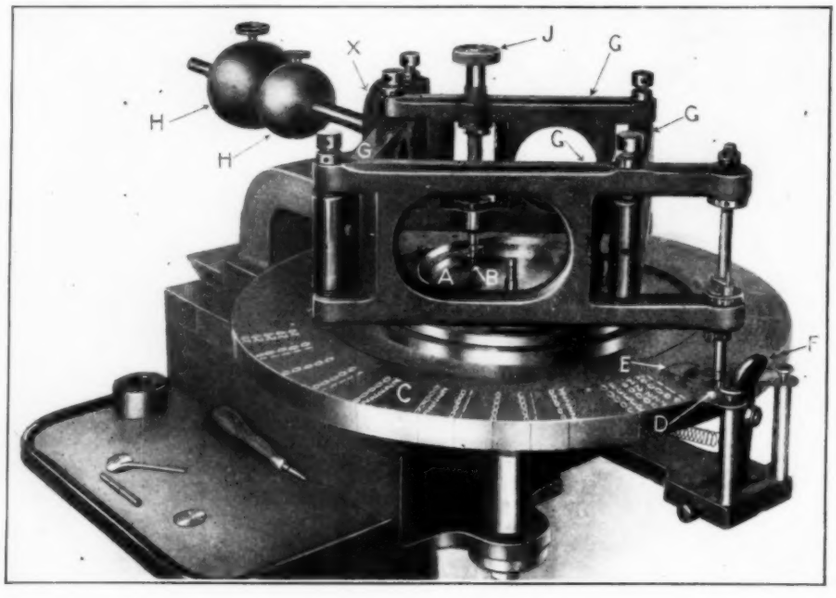



Fig. 6. Pantograph Engraver

S. B. R.

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Tests of peat fuel will be made by the Ontario Department of Mines under the direction of E. F. Haanel. As has already been noted, the government owns a peat bog at Alfred, Ontario, and this will be worked for three months in the coming year to demonstrate processes of air drying. It is expected that several thousand tons of fuel will be manufactured. Part of this supply will be forwarded to Ottawa for use in the government gas-producer plant. The rest of the fuel will be sold for local consumption. The results of these experiments are expected to prove favorable.

# Letters from Practical Men

**Concerning the details of making things in machine shops, from the first sketch to the shipping room.**

**A letter good enough to print is good enough to pay for. The value is in the idea—not the length of the letter.**

## Drilling Awkwardly Located Holes

A clever little tool was recently worked out by one of the shop foremen for drilling a hole in an awkward place, and the idea may be of interest to readers.

It was necessary to drill a ¼-inch hole ⅜ inch deep in an aluminum casting, as shown in the sketch, Fig. 1, and at first thought it looked as though it would have to be drilled from above and the hole plugged.

There were about 5200 of these holes to be drilled, and the foreman did not relish the idea of plugging them, so he rigged up the tool shown in Fig. 2.

The main part is an old discarded hand-drill frame resurrected from the scrap pile to form the basis of this tool. A chunk of cast iron was bored out to carry shafts at right angles and suitably attached to the frame, a pair of bevel gears furnishing the means for transmitting the motion from the crank to the drill-chuck spindle.

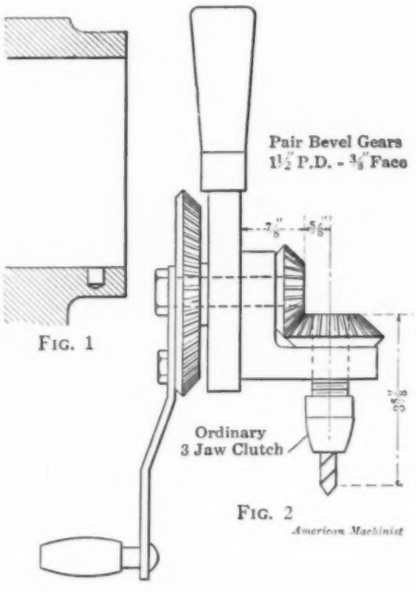



FIG. 1

FIG. 2

DRILL FOR AWKWARD HOLES

As the shaft carrying the drill can now be set back into the large opening, the hole can easily be drilled squarely.

The making of this tool called for very little outlay in either time or material, the bevel gears being picked up from some discarded tool. It would be quite possible to elaborate on the tool and so increase its range, but it has done very satisfactory work just as it is.

Cleveland, O. E. W. WEAVER.

## Design of Dies for Sheet Metal Drawing Operations

Figs. 1, 2 and 3 show in section a combination set of tools at different points of its operation.

The purpose of these drawings is to show the principle of design and operation, nothing else, they were drawn with this in view and not for any particular piece of work.

The purpose of the design is to get stock in the center from the first tools, for the next operation, without breaking or thinning the metal from a compara-

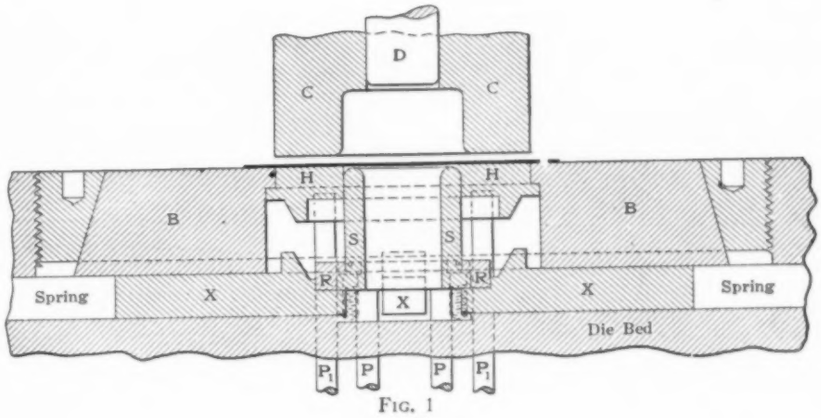



FIG. 1

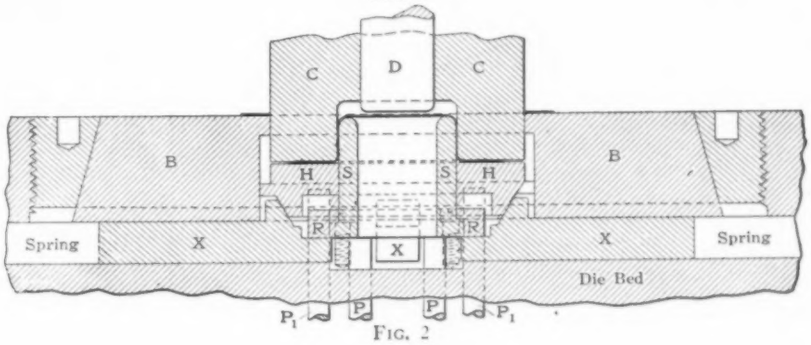



FIG. 2

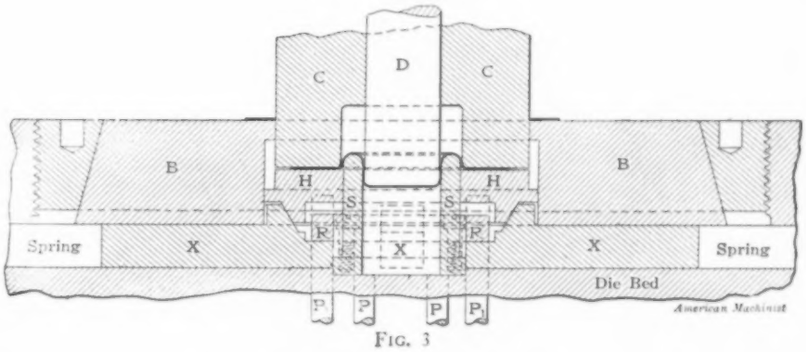



FIG. 3

DESIGN OF DIES FOR SHEET-METAL DRAWING

tively large area; also to reduce the number of stripping operations.

A can top having a small projection, ordinarily requires six operations to form it, but with these tools it should not take over two or three at the most from the flat metal.

Fig. 1 shows the tools in position about to cut a blank, the blank solder *H* being flush with the blanking die *B* and held in this position by the spring pins *P P*, the sleeve *S* also being forced against the ring *R* by the spring pins *P P*, and resting on the positive supports *X X X*, which are slides forced against the ring *R* by the spring; the ring *R* is held in position by four screws.

Fig. 2 shows the tools after the blank has been cut by the cutting punch *C*, which in Fig. 2 acts as a drawing die. The sleeve *S* acts as a drawing punch, thus far, the punch *C* having forced the blank holder *H* down until it has forced the slides *X X X* back so that a slight movement downward of punch *C* will force them back so that the sleeve *S* will rest on the pins *P P* entirely and not on the positive support *X X X*. When thus far the punch *C* ceases its downward movement, and at about this time the drawing punch *D* starts to reverse, draw the metal in the sleeve *S*, Fig. 3, and while doing so forces the sleeve *S* down to the seat in the die bed, forming the metal as shown in Fig. 3 by the heavy line.

Of course, if the stock shown over the end of the sleeve *S* is not wanted for the next operation the sleeve *S* may be given a greater fall or enough to bring the top flush with the top of the blank holder *H*, or it may be given a fall not so great. This distance must be governed by the amount of stock and where it is wanted for the next operation on the shell.

When the punches *C* and *D* withdraw from the die, the parts *H* and *S* are forced to follow it by the spring pins *P P* and *P P* delivering the work on top of the die.

As soon as the sleeve *S* strikes the ring *R*, the slides *X X X* are forced to their original position by their springs and the tools are again as shown in Fig. 1.

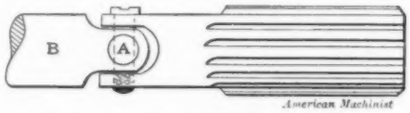
These tools are for a double-action press.

C. P. McARTHUR.

Waterbury, Conn.

## A Floating Rose Reamer for a Lathe

For very accurate work the floating reamer has come to be the standard. Here is one I have used very successfully on a lathe.




A FLOATING REAMER FOR THE LATHE

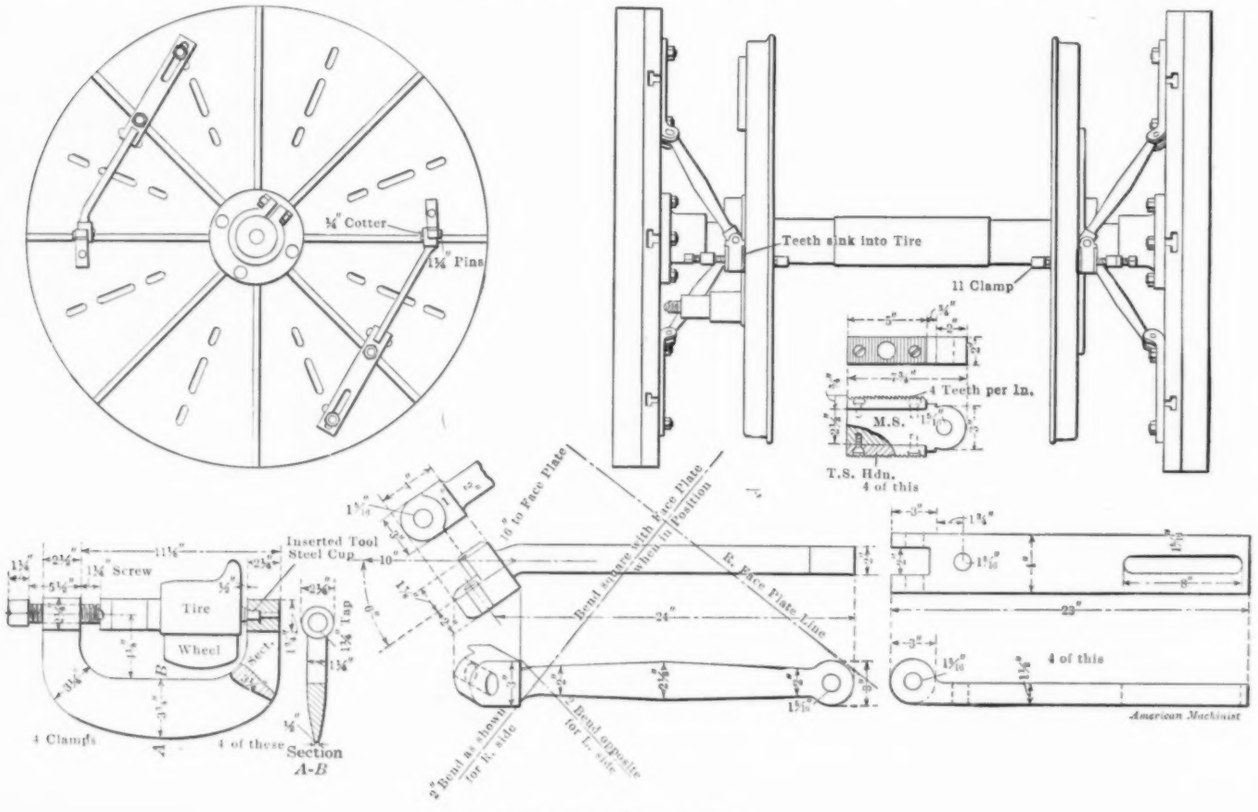
We had a large number of brass tubes for telescopes to be turned and bored. The outside diameter was to be turned to 2½ inches and the inside diameter 2⅛ inches. The 2⅛-inch size had to be very accurate and as the tube was fourteen inches long it made a hard job to bore the hole straight. So the hole was roughed out to 0.02 of an inch of the required size. The reamer that is shown here in the accompanying drawing was then used. One end of the shank is turned tapered to suit the tailstock. The shank and the reamer are coupled together by the means of a knuckle joint. The pin *A* can slide slightly in the holes in the shank *B*.

This reamer was used for three weeks every day and all of the tubes were reamed straight.

Washington, D. C. H. D. CHAPMAN.

## A Wheel Lathe Drive

The drawing shows a homemade wheel lathe drive which has proved very successful and which will drive wheels from 42 to 74 inches without removing the drivers from the face plate. They also swing back against the face plate leaving a free opening between face plates when removing or applying wheels. When the wheels are in place the arms with notched dogs are set against the wheel rims and horse-shoe clamps applied and when the cut is applied to the tire, the notched dogs




DRIVE FOR WHEEL LATHE

take hold of the rim and give a positive, rigid drive to the wheels.

The drawing gives details. The rig can be made from scrap material at any railway shop. W. J. SHADLE.

Shop foreman, Chicago & Northwestern Railway Company, Clinton, Iowa.

## Removable Side Motion Plates

The removable side-motion plates for driving engine truck and trailer boxes now being used here are shown in Fig. 1. These plates have been in use on an Atlantic type engine driving truck boxes since December 1, 1908, and have proved very successful. We have renewed the side motion on left main box twice at a cost of $1.12 for labor, $1.20 for babbitt or a total cost of $2.32 to put side motion in first-class condition on one driving box. Time consumed to do work was two hours. The illustration shows how they are applied to all boxes that received side wear.

These plates can be applied and renewed without dismantling any part of engine, all that is required is a socket wrench to remove the two nuts on studbolt, when plates can be removed by hand by sliding each plate in dovetail grooved from center outward. After plates are rebabbitted and faced the proper thickness they are applied to boxes in the same manner.

The object of tapered washers at each side of plates is when pressure is applied to nut on studbolt it forces both plates up solid in dovetail groove in top of box, making the plates absolutely solid with box. This method can be applied to any box without changing the patterns. We make the plates from cast steel cast in halves and finished all over except the circle for brass and collar fit.

These plates are finished top and bottom in jig, shown in Fig. 2. This jig makes all plates interchangeable and planes plates for six complete boxes at one setting. About ¼ inch of babbitt is sweated to the hub face of these plates, after which they are faced to proper thickness. The plates are indestructible and will last for years.

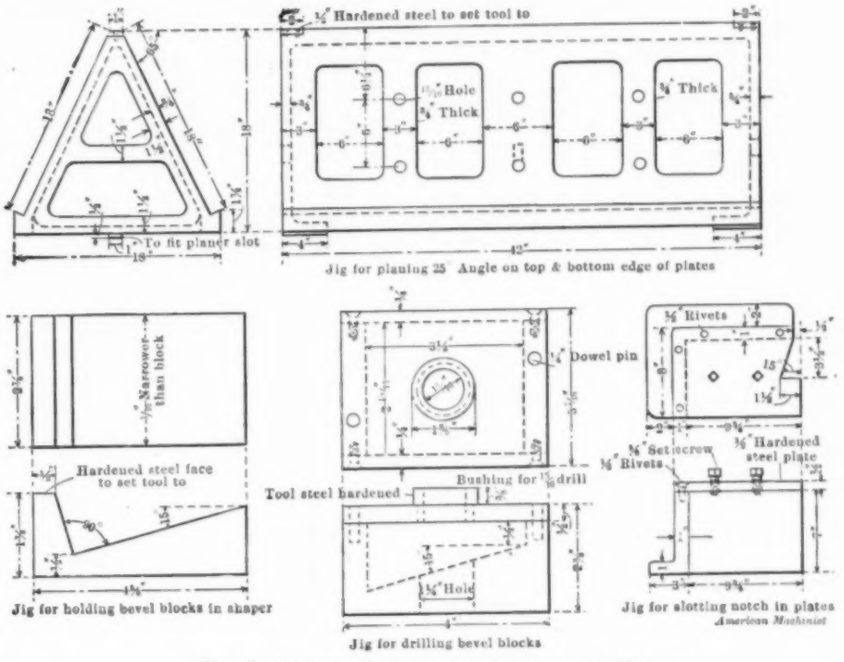



FIG. 2. JIGS FOR DRIVING-BOX SIDE-MOTION PLATES

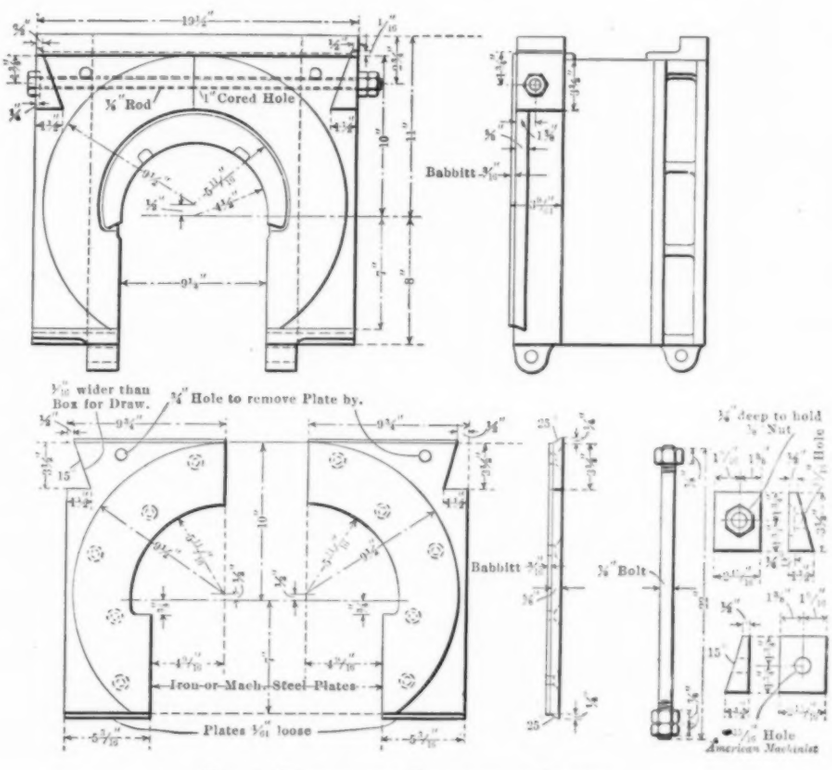



FIG. 1. DRIVING-BOX SIDE-MOTION PLATES

To do work on boxes proceed as follows: place set of boxes on planer (hub side up), take surface cut from boxes and dovetail them at top and bottom, 25 degrees, which finishes. This work is done to gage, which makes all boxes duplicate. Side-motion plates are then planed top and bottom on *jig shown* which makes the plates 1/32 inch loose top and bottom in boxes. After this the plates are put in place by hand from each side of box.

The slot in box to receive studbolt is cored in box. The studbolt is of rough machine steel, threaded in bolt cutter. The plates are also beveled and machined on jig for washer fits. The two beveled washers are cast steel and finished in jig. It will be noted that the beveled washer to left of box is cast ¼ inch deep to fit hexagon on nut; this prevents nut from turning on studbolt.

The cost of this method for one complete box.

| | Material. | Labor. | Total. |
|---|---|---|---|
| 2 cast steel plates | $0.66 | $0.20 | $0.86 |
| 1 stud bolt | 0.10 | 0.05 | 0.15 |
| 2 washers | 0.20 | 0.10 | 0.30 |
| Planing of one box | | 1.14 | 1.14 |
| Total cost | | | $2.45 |

It now cost us $2.32 to take up side motion on one box when wheels are under engine, while by the old method the cost to renew side motion on one box is as follows: Dropping the driver, labor cost $10, material $2.85, or total cost of $12.85 besides the loss of 15 hours' time

to engine from service and the other work which is always found when wheels are dropped.

The removable side-motion plates makes a saving of $10.85 on every box when side motion requires renewing and on account of its simple construction, side motion will be kept in good condition, making the engine ride better and obviating expensive breakages where excessive side motion is allowed.

Clinton, Ia. W. J. SHADLE.

## Using the Open Tailstock on the Bench Lathe

Having had considerable deep drilling of small diameter to do and knowing the advantages of the open tailstock on the bench lathe for this class of work, I have made some sketches of some of the work turned out with a tailstock of this kind and a suitable set of tools.

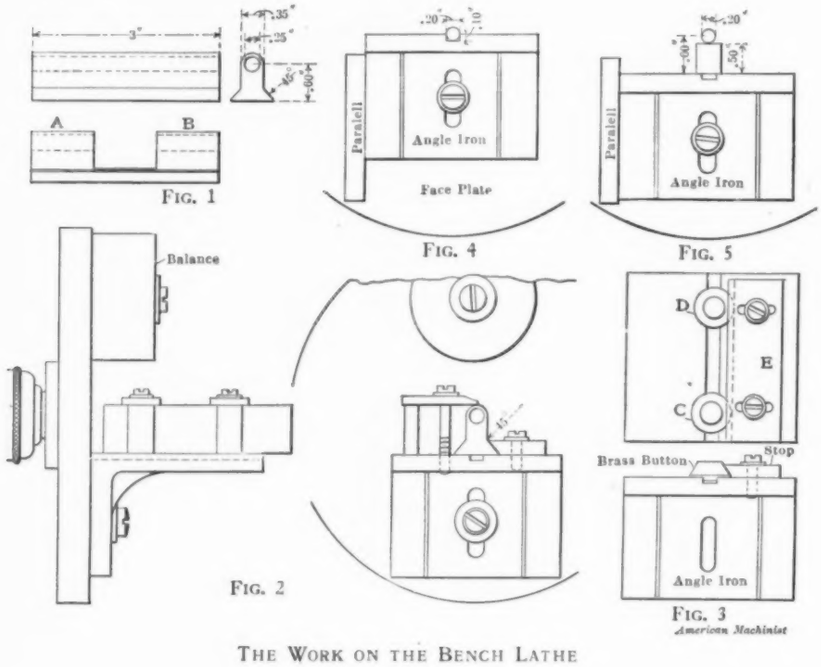


FIG. 1 FIG. 4 FIG. 5 FIG. 2 FIG. 3

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THE WORK ON THE BENCH LATHE

Fig. 1 shows a piece, the hole in which was required to be straight and parallel to the sides for securing alinement of the portions *A* and *B*. This work was swung up as in Fig. 2 which requires no description. The method of locating the work on the angle plate is shown in Fig. 3. The brass buttons, *C* and *D* were turned down at one end to a sliding fit in the groove of the angle plate, the bodies being turned to suit the angle of the work. These buttons were removed after clamping the stop *E* in contact with them. A taper plug was now fitted into the face plate and turned down to 0.20 inch diameter for the purpose of locating the angle plate on the face plate as in Fig. 4. Then a parallel was clamped against the edge of the work to allow it to be dropped as in Fig. 5, thus measuring off the distance 0.60 inch required. All that was now necessary was to place the work and clamp it as shown in Fig. 2.

The first three tools of the group in

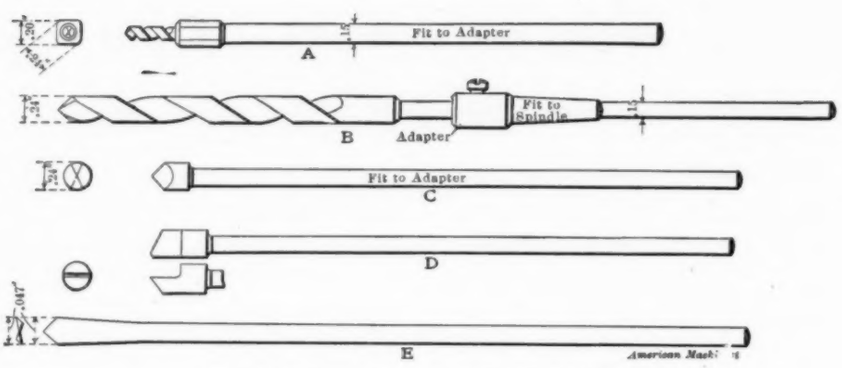


FIG. 6. BENCH-LATHE DRILLS AND REAMERS

Fig. 6 were used for these holes, first boring work to the largest diameter of tool *A* somewhat deeper than the length of the drill portion. This drill was followed by tool *B* which was a regular drill with a piece of wire sweated into a hole in its shank, and this in turn was followed by tool *C*, this process being repeated until the hole was drilled through. The holes required no boring except for starting the reamer. After reaming, a rectangular piece of brass containing two screw holes for clamp screws was gripped in the miller vise and grooved about 0.03 inch deep and in this groove the work was clamped when the middle part was cut out.

Parts *F, G, H* and *I*, Fig. 7, were back rested and drilled in the manner just described, but were reamed with the hog-nosed reamer *D*, Fig. 6. Whenever the size of the hole permits the use of the first three tools *A B C*, Fig. 6, they greatly facilitate the work but *J*, Fig. 7, which was drilled through from one end, shows the possibilities of the drill *E*, Fig. 6. This drill wears some in passing through the length given, but the hole is easily raised to size by passing a few similar drills through in succession, each varying 0.0005 or 0.0006 inch. This is done by revolving the drill at high speed and presenting the work with the hands. With a supply of oil these drills produce a brilliant hole, and are cheaper to make than a reamer. All of this work was turned

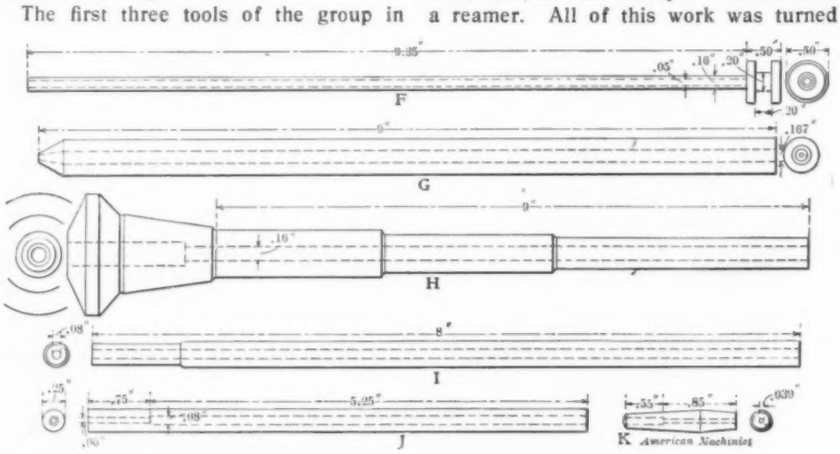


FIG. 7. SPINDLES DRILLED IN THE BENCH LATHE

off on the outside after drilling and reaming except *K*, Fig. 7. *F*, Fig. 7 was hardened at each end for a distance of about ½ inch.

Elgin, Ill. GUS HAESSLER.

## Press Tools for a Trunk Corner Plate

The sketches, Figs. 1 and 2 show press tools for making plates which fit on the corners of trunks, to protect them from injury. The sketch of the second-operation tools, Fig. 2, shows the piece bent to shape. There is quite an important kink involved in bending the piece up in this operation, which would stick a good many diemakers.

Some three years ago I was working in a jobbing shop and we had a similar piece to make with the little ball *A* on the bend. The boss, thinking it was easy, took the job in at a reasonable figure and after spending considerable time on the job and losing money on it, we were about to give it up when he thought of a new kink which was successful.

The blanking die was made in the usual way, blanking and piercing the holes with pilots in the punch to insure uniformity in the pieces. With the roll feed 40,000 blanks were produced in a day of 10 hours. The stock was 3/64 inch thick and the cheapest grade of black steel.

The first operation consisted of bending and drawing the ball *A* and starting the bend *B* for the 45-degree bend in the second operation; this is the secret of making these pieces successfully. If you do not start this bend in your first bending and forming operation the work will break. The edges in the first operation were bent up all around at *C* to 45 degrees, the sides were bent at right angles as shown at *D*, the ball *A* drawn in shape and the angle started with the bend at *B* for the second operation. The spring pin *E* holds the metal while the ball is being drawn to shape in operation No. 1.

In operation No. 2 the rest of the ball *A* was drawn and the final bending accomplished and the piece was ready for tumbling after which it was plated.

CHAS. W. DORRICOTT.

West Philadelphia, Penn.

## Flanging a Blank Sleeve in a Punch Press

The sleeve, Fig. 1, was originally made as a casting, but as it was necessary to produce it cheaper the following method of manufacturing which reduced the cost nearly one-half, was adopted: Fig. 1 shows the sleeve when finished; Fig. 2, the parts before assembling; Fig. 3, the press tools which formed the two parts into practically one piece so far as appearances went, when finished.

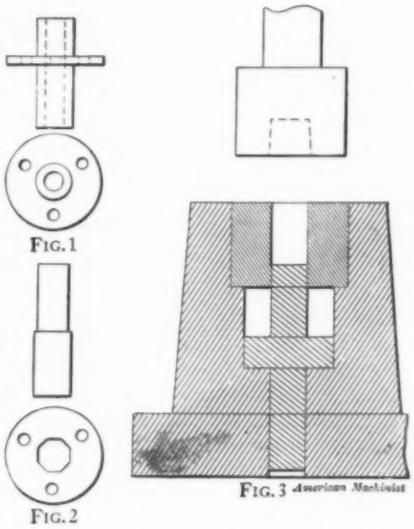


FIG. 1

FIG. 2

FIG. 3 *American Machinist*

MAKING A FLANGED SLEEVE

The blanks were punched out of 14-gage hard sheet brass with an ordinary set of blanking tools, but with an octagon hole in the center, so that when the shouldered stem was confined in the press it kept the stem from turning and also left a small amount of space to be filled up. The stem was made of brass rod, the outside diameter slightly larger than the outside diameter of the octagon hole and shouldered down on one end so as to go into the smaller diameter of the hole. It was left long enough so that when the punch came down it compressed the metal to the diameter of the hole in the punch which was the same diameter as the brass rod and covered the hole in the blank and formed a close joint.

The die bed was of cast-iron with a flange for clamping down. It was recessed for the die and plunger as shown. The die was reamed with a slight taper, so that the work could be easily ejected with the knockout as commonly used on this class of press work. The die was cast steel drawn tightly in the die bed to hold it in position. The punch was of cast steel with the hole reamed a little more tapering than the die and left the work in the die. The tools were hardened and tempered a light straw color as the harder the tools are left on this class of work, the less liable the work is to stick.

These tools made a very satisfactory job, as they cut out the turning and the drilling and there was no loss in casting through blow holes; against this was the blanking and the turret work, which, when compared with the other operations and the polishing, was easier to do, so there was a saving of nearly 50 per cent.

London, England. C. PETITJEAN.

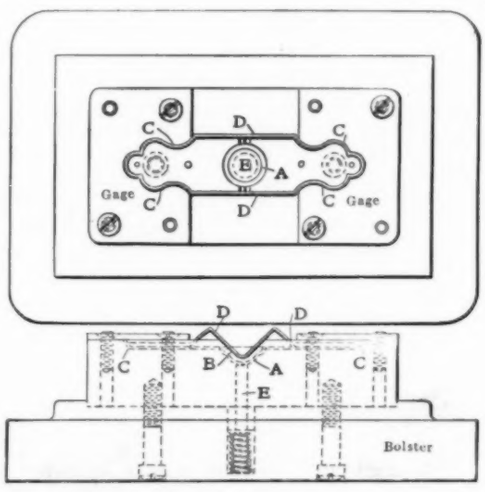
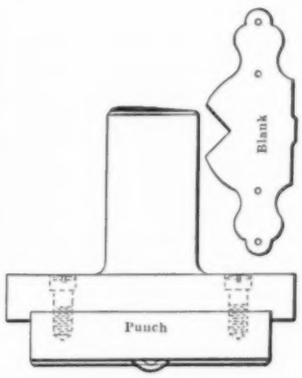



FIG. 1. First Operation



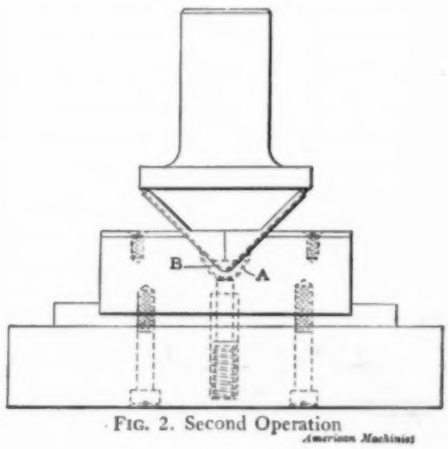




FIG. 2. Second Operation

*American Machinist*

PRESS TOOLS FOR A TRUNK CORNER PLATE

# Fluxes Used in the Brass Foundry*

By Irwin S. Sperry†

*Some of the so-called secret fluxes and mixtures in founding of materials clearly defined.*

*Successful fluxes for aluminum, nickel, copper, brass, bronze or composition, German silver, washings, grindings, etc.*

*A paper read at the Detroit meeting of the American Brass Founders' Association held on June 6-10.

†Editor of *The Brass World*.

In the early days of brass founding, two things were guarded jealously: The mixtures and the fluxes. At that time it was not an uncommon occurrence to hear one say, when speaking of a new proprietor of a brass foundry: "He will get along all right. His father left him all his formulas for mixtures and fluxes." It seemed to be taken for granted that even capital itself was subsidiary to these heirlooms. Soon the chemist began to make serious inroads into the mixtures and their secrecy faded away gradually but surely. The mystery of the fluxes was more difficult to eliminate, as unlike the castings themselves, they did not go beyond the foundry. They could not be analyzed without obtaining at least a small quantity, and this was difficult to do as the brass founder carefully guarded them and the materials from which they are made. In the course of time, however, the secret of the fluxes went the way of the brass mixtures, so that by the process of evolution, "secrets" finally became general technical knowledge. Few brass founders are now found who claim to have anything original or remarkable in the flux line.

When fluxes are mentioned, it is frequently asked: What is their advantage, and are they really necessary? To answer this question I will say that I believe the flux question is greatly overdone and likewise imperfectly understood. It was only a short time ago that I discovered a brass founder using lime in making an 88-10-2 mixture from new metals. He said that "somebody" had told him that it was good for bronze. Although cheap substance that it is, he was wasting his lime, as it remained on the metal like so much dirt and had no more effect than sand. In another instance I found that a brass-ingot maker used a couple of handfuls of a mixture of common salt and borax on the top of a pot of yellow brass after it had been skimmed and immediately before pouring. The mixture was thrown on and at once skimmed off without waiting for the borax to even stop swelling. He, too, would have been equally as well off without the flux. Another, but diametrically opposite case, was a brass founder who attempted to melt his emery grindings in a crucible without flux, and obtained about a pint of metal and half a bushel of dross. In this case a flux was needed.

It will hardly be advisable to go into a detailed enumeration of all the fluxes known to mankind and which can be used in brass melting, as it would be of little value. Many substances once used for this purpose have now become obsolete and many others have proved to be valueless. It seems preferable, therefore, to give a description of those fluxes that the test of time has proved valuable and the manner in which they should be used.

### Flux for Aluminum

For years those who melted aluminum used no fluxes at all on it, not even charcoal, as it was soon found that this material did more harm than good. On account of the lightness of aluminum, charcoal does not readily free itself and is apt to become entangled in the metal and produce small, black spots in the casting. It is only within the last few years that a flux has come into use.

For aluminum, the flux that is most extensively used, and which has proved to be so valuable is *chloride of zinc*. It seems to react with the aluminum, forming chloride of aluminum and metallic zinc, which alloys with the aluminum. When this takes place, the dross is changed to a fine, granular condition which readily skimmed off. When aluminum is melted, the surface is covered with a rather thick mass, but the chloride of zinc will change it to a perfectly clear one closely resembling in appearance molten tin or lead. It is needless to say that such clean metal gives better castings.

The method of using chloride of zinc as a flux in melting aluminum is simple. Small pieces are thrown on the surface after the melting has been completed. Enough has been added when the surface is clear. A very small amount usually suffices and for 50 pounds of aluminum a piece the size of a walnut is generally enough. The metal is stirred immediately after the addition and then skimmed. Those who have not used chloride of zinc should try it, as it is an excellent material.

### Flux for Nickel

The flux used by makers of nickel anodes has proved to be a good one. It was first used by A. M. Hill, of New Haven, Conn., one of the first in the United States to make nickel anodes and the inventor of the well known "Hill-Barrel" for grinding brass furnace ashes. Mr. Hill has retired from the anode business, but for many years he used this flux with the best of results. It is not only good, but cheap. It is composed of the following: Lime, 3 parts; fluorspar, 1 part.

The manner of making it is to take the lime and slake it as though mortar is to be made. Then stir in the fluorspar and allow to become solid. It is then broken up into small pieces for use.

While fluorspar alone is a good flux, it becomes very fluid when melted and rapidly attacks the crucible. I have seen a new plumbago crucible ruined in one heat when fluorspar was used alone. It seemed to soak in and dissolve out the clay from the crucible mixture and leave nothing but the graphite. The crucible collapsed like an egg-shell when grasped with the tongs. The use of the lime with the fluorspar is to increase the melting point so that it will not readily attack the crucible. The proportions previously mentioned have been found satisfactory for nickel. Less lime will render it more fusible.

This flux has been found particularly serviceable in melting old nickel anodes, as it dissolves out any earthy matter which may be on them. It is used for both old and new material, however, and may be called the standard flux for nickel. The proportions used are about a pint or a good handful for new nickel, and twice as much for old material.

It must not be imagined, because fluorspar is toned down with lime, that the flux will not act on the crucible, for it certainly will. In this connection it should be borne in mind that all fluxes act on the crucible to a greater or less extent, otherwise they would not be of value as a flux.

### Flux for Copper

There have probably been more fluxes proposed or used for copper than any other one metal or its alloys. The fact that copper cannot be melted alone and obtain sound castings from it has brought about this fact. Practically every known chemical has been tried. In the selection of a flux for copper, it should be known whether pure copper castings are to be made or whether the copper is to be alloyed to make brass or bronze.

To make sound copper castings with a flux alone, and without the use of "physic" like silicon-copper, magnesium or similar materials (which are, strictly speaking, not fluxes) is a difficult matter. For this purpose I have found that *yellow prussiate of potash* (potassium ferrocyanide) is excellent. With it sound copper castings may be made, but I do not advise its use as far better results

may be obtained by the usual deoxidizing agents, such as silicon-copper, magnesium, phosphorus, etc.

In melting copper for producing brass or bronze, the question is different from the preceding one. For this purpose there is nothing better than *common salt*. Its value lies in the fact that it possesses the property of reducing any oxide of copper which may form during the melting. It has been used for years in the brass industry and the memory of the "oldest inhabitant" fails to indicate the date of its inception.

Common salt is so efficacious in reducing oxide of copper that as far back as 1882, R. Monger, in the *Chemical News*, proposed it as a means for determining the quantity of oxide which copper contains. His method was to melt salt in a clay crucible and then drop in the weighed sample of copper. After allowing to remain for a short time, the crucible was cooled and broken when a button of pure copper was obtained. The difference in weight gave the amount of oxygen (or its equivalent oxide of copper). Some very satisfactory results were obtained.

In melting the copper for making brass or bronze, about a handful of common salt is used and is preferably put in after the copper has begun to melt. If introduced with the copper, it melts before it and is apt to volatilize and waste. The action on the crucible is also greater. Too much salt produces a liquid that is apt to penetrate the crucible like fluorspar, although not as violently or as rapidly. The amount of salt previously given is used for a pot of metal holding about 150 pounds. The quantity need not be exact as a variation either way does no harm as long as a sufficient quantity is used to do the work.

The theory of the action of the common salt seems to be that at the temperature of the molten copper it breaks up or dissociates into metallic sodium and chlorine gas. The latter escapes and the sodium performs its work in deoxidizing.

### Flux for Brass

The flux almost universally and exclusively employed in brass melting is *common salt*. As previously mentioned, its action is to reduce the oxide of copper formed in melting the copper previous to the addition of the spelter. The brass rolling mills in the Naugatuck Valley, Conn., and elsewhere as well, all use it, and one large company uses approximately half a ton a day. It is the universal and *only* flux used in making brass for rolling. For years it has been employed for this purpose and to my own remembrance always has been. It seems to give all that is desired and has the distinct advantage of being cheap. Any kind of common salt will answer and a pure material is unnecessary.

The quantity used is about a handful to the crucible containing about 150 pounds of brass. One concern uses one handful, while another believes that double this quantity should be used. A good sized handful, however, seems to be sufficient. It is added after the copper begins to melt, as this appears to be the best time to introduce it. When the right conditions have been produced, there will be little slag on the brass when it is skimmed.

It is worthy of note that, although every brass rolling mill uses salt in brass melting, few brass founders who make sand castings employ it. Many of them have never heard of it and others seem to think that it is a waste of time and money to employ it. I advocate its use under all conditions, and as it is theoretically correct, has been found by actual practice to improve the quality of the brass, and is so cheap that the cost of the brass is not appreciably increased, it seems to me that every brass founder should use it, whether he makes new metal or melts scrap, as the character of his castings will be improved.

### Flux for Bronze or Composition

What has been said about the use of common salt in melting yellow brass applies equally well to composition or bronze and it is used in identically the same manner and in the same quantities. It makes no difference whether phosphorus or other deoxidizing agents are employed, salt is used just the same.

### Flux for German Silver

German silver is such a refractory material in the rolling mill that much time and thought have been given the subject of a suitable flux for it. It is a singular fact that the bulk of the german silver manufactured in the United States is made by two concerns. One uses a flux in making it, while the other uses none. In justice to the concern which uses no flux at all, I will say that their german silver has a little better reputation and they have the most particular trade. I cite these examples simply to indicate that fluxes do not constitute the "secret" of making german silver by any means.

The use of a flux by the other concern dates back to 1869 when Frederick Wilcox, of Waterbury, Conn., a brass caster engaged in the manufacture of german silver, had trouble with black, minute spots in his metal. Tradition states that he gave the matter much thought and finally believed it to be caused by the presence of carbon in the metal. Further "thought" indicated to him that the only method of removing it was to use a nitrate of some kind which would evolve oxygen and oxidize the carbon. Nitrate of soda was, therefore, used and upon its use in german silver he obtained a patent (U. S. Patent No. 96,524, November 2, 1869). As this material was found to work better with black oxide of manganese, the two were afterward used together and now constitute the flux of the aforesaid concern.

Personally I doubt whether this flux has much value, and the fact that it is possible to make good german silver without it would seem to indicate it. I feel quite sure that there is no oxidation of carbon, as nitrate of soda, when allowed to melt on copper, will not oxidize it but instead will actually render it sounder. It is also a singular fact, which I have already demonstrated in practice, that a mixture of nitrate of soda or the nitrate of potash (niter), mixed with black oxide of manganese and used as a flux on copper, will actually introduce metallic manganese into the copper, showing that there is a reducing action. This explains, I believe, the reason for the action of the flux. A slight amount of manganese is introduced.. It is also borne out by the fact that, within the last few years, metallic manganese has come into use as a deoxidizing agent for german silver and similar nickel alloys. Its use is preferable to introducing manganese through the agency of a flux, as the results are then positive and certain and a predetermined amount of manganese can always be added. The use of manganese for this purpose has been attended with excellent results, and it seems to be the natural deoxidizing agent for nickel and nickel alloys.

In making german silver, common salt is used in the same manner and with the same results as those obtained in brass and bronze.

### Flux for Washings, Grindings, Etc.

In the melting of the washings from the reclaiming of brass foundry ashes, a flux must be used in the majority of instances unless they have been washed very clean and this is rarely done. Even with clean washings it is advisable. The same rule applies to grindings, skimmings and similar waste materials. Unless a flux is used when they are melted, a union of the particles of metal is prevented by the presence of so much foreign matter, and instead of fluid metal there is usually obtained a small quantity in the bottom of the crucible and a large mass of pasty material fritted together. When a flux is used, the foreign matter is dissolved and clean metal left.

For use in melting brass, bronze or composition washings, grindings, skimmings and similar material, I have found nothing better than *plaster of paris*. It is a cheap and excellent flux for this purpose. How far back it was used for this purpose I cannot say, but it was first called to my attention by the late C. S. Moore. With due respect to him, I be-

lieve he can really be called the "father" of the present scrap metal industry in the United States as he was responsible for many innovations (such as the "transmutation" of yellow washings into red) and I firmly believe he was the first to use plaster of paris as a flux. He informed me to this effect and I have no reason to doubt his word.

The value of plaster of paris as a flux in melting washings, grindings and similar material is that it possesses the property of dissolving what foreign matter may be present in the shape of sand, slag or oxide, and it has practically no action on the crucible. In addition it is quite cheap. On account of the fact that it has little action on the crucible, any desired quantity can be used. It melts readily and forms a thin slag.

To melt washings or grindings with plaster of paris, mix about 5 pounds of it with each 100 pounds of the washings when they are placed in the crucible. Then melt in the usual manner. If the slag at the conclusion of the melt is not sufficiently fluid, more should be added. When the metal is completely melted, pour the entire contents of the crucible into the ingot molds. *Do not attempt to skim it.* It is unnecessary. The slag will run into the molds with the metal and rise to the top. Allow the mass to cool and then dump the ingot molds. The plaster of paris slag can then readily be detached by a blow from a hammer, or it frequently will fall off under normal conditions. If desired, it may be used over again. It will be found a very satisfactory flux for this purpose.

Plaster of paris is calcium sulphate, and when used as a flux, the action seems to be one of simple solution. The molten mass dissolves the foreign matter as sugar is dissolved by water.

When coal is present in the washings (as it usually is) there is a slight reduction of the calcium sulphate to sulphide and an odor of sulphur will be noticed during the melting. This seems to do no harm and I have never been able to find that it directly injures the metal. In fact, it appears to act in an opposite manner, and any iron that may be present is changed to sulphide and enters the slag. I have always advocated the use of plaster of paris in melting scrap materials containing iron, and have invariably found it to be followed by good results.

### Necessity of Charcoal

I have made no previous mention of the use of charcoal for the reason that it is not properly a flux, although it takes the place of one. I can say without hesitation that charcoal should be used as a covering in melting all metals previously enumerated except aluminum. Its value lies in the fact that in burning it supplies a reducing atmosphere and thus prevents the oxidation of the molten metal. At the same time it covers the metal and prevents the products of combustion from coming in contact with it. It is free from sulphur, which renders it the ideal material for this purpose. It should be coarsely granulated and not powdered, so as to allow its covering the metal completely without danger of immediate combustion. Fine coke and coal, although frequently used, are much inferior to charcoal as they contain more or less sulphur, which injures fine grades of metal.

# Aluminum Pulleys for Planers

Special Correspondence

*In order to reduce the flywheel inertia, a bothersome contingency in reversing planers, experiments with pulleys made of aluminum alloy have proved successful.*

*Steel, paper and xylotype were tried, all having disadvantages compared to the aluminum pulleys, the use of which shows a saving of nearly 25 per cent. in power and a gain of 15 per cent. in strokes per hour.*

Some few years ago, when the users began speeding up planers and the old shifting-belt planer with its narrow belts and sometimes large diameter pulleys caused a good deal of trouble, then the clutch idea was taken up by quite a number of manufacturers. After watching a number of others and also building one themselves, the Cincinnati Planer Company came to the conclusion that the final outcome would be something more fool proof, something that could be put in the hands of all users and for everyone who did not care to bother about making adjustments at any time. After weighing these matters carefully, they took up the matter of reducing the weight of machine pulleys so as to reduce the flywheel inertia, which, of course, is at the root of all evil in the reversing of planers.

The first thing, of course, was to try steel pulleys, and while they reduced the weight a small percentage, the constant reversing on short stroke would warm the pulleys up and cause them to change their shape slightly, so that they would run out, which is no doubt due to the unequal expansion.

Next paper pulleys and also a composition called Xylotype, were used, and while they reduced the weight more than the steel pulleys and also gave better adhesion for the belt, they would wear down so rapidly that in a short time the tight pulleys were smaller in diameter than the loose, with the consequence of serious trouble in the shifting of the belts.

After going through these various stages and constantly looking for something better, they noticed the automobile manufacturers using aluminum to secure lightness, and the matter of some aluminum alloy came up. When starting to make pulleys of aluminum, they of course ran in to the additional trouble, first to get the right alloy that would not crack on such light thin castings, then to get same so that it would retain its shape under all conditions, and also to get the patterns so as to secure the right shrinkage for the final finish in the shop, which, we understand, required the making of quite a large number of patterns until it was decided that they were about right. The aluminum-alloy pulleys reduce the weight about 60 per cent., reducing the horsepower required to drive the planer very much, as the most power on the planer is always consumed when reversing and not during the cut or return. They recently tried a planer that was running about 35 feet cut and 85 feet return, and with cast-iron pulleys the machine made 165 strokes in 30 minutes and with aluminum pulleys they made 189 strokes in same time. In both cases the length of stroke was 4 inches. This shows quite a saving of time and in addition to that makes the planer reverse much more promptly, so that it is possible to machine in very close quarters and very close to the shoulder, which under ordinary conditions would be risky and not to be attempted at high speeds.

In trying this out on a 72-inch motor-driven planer, they found that it took 39 horsepower at the point of reversal with the cast-iron pulleys and with the aluminum pulleys in place it only took 30, showing quite a saving of power. Owing to this saving of power, they have been putting these aluminum pulleys for the last few years, on most of their motor drives and also on all machines requiring a very high speed, or when they knew that the work was going to be in very close quarters or some that always required short strokes. These figures show a saving of nearly 25 per cent. in power and a gain of 15 per cent. in strokes per hour.

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American Machinist

# Editorial

## Plans for Compensation for Work Accidents

One of the most gratifying signs of the times for those who have the ultimate good of the machine industry at heart, is the unmistakable tendency toward prescribed compensation for work accidents. In some cases this will mean the formation of mutual companies for this purpose, some of these being already under consideration, while in others it will mean that the business will be handled by the regular accident companies. In either case it means the extinction of the ambulance chaser as well as his more aristocratic, but none the less undesirable twin brother, the adjuster who browbeats the victim or his dependents until they accept a pittance or receive nothing.

The present tendency seems to be toward a low insurance premium to be paid wholly or in part by the worker which is probably the natural beginning, although many feel that this will eventually develop into an insurance which will be as much a part of the overhead charges of a business as the fire insurance which every firm carries without question. This will be hindered by the fact that we have 46 State governments to consider, unless manufacturers will agree to act along this line without waiting for compulsory legislation on the subject and is one of the drawbacks of our State government.

One of the objections sometimes raised to this is that liability insurance would still be necessary, which is only true until compensation becomes automatic, so that no suits are necessary or possible. But even at present, we are informed that at least one liability company is ready to reduce its liability rates one half in all cases where the collective or blanket accident policies are placed with them.

The most difficult part of the whole problem is to decide on a compensation which will be fair to all concerned. But whatever the amount, we believe that most will agree as to the undesirability in nearly all cases of making the payment in a lump sum. There are few cases where it would not be better to pay an amount sufficient to defray doctors' bills or others due to the accident and make the remainder in the form of weekly wages for a term of years to be decided on. This would be better for the recipient as well as easier on the small manufacturer, who might try to carry his own risk. Such payments should, however, be a first claim on the business as a protection against business reverses.

Whatever plan is adopted, there is sure to be a better feeling on both sides and a removal of much of the real suffering as well as the feeling of injustice which now exists in too many cases.

## Good Inspection Is Not Blind Adherence to Specifications

Proper inspection protects both the buyer and seller. Each has rights which should be protected. The buyer should get that for which he contracts and the seller should be protected from unnecessary and trivial exactions. The purchase by detailed specifications and competitive bidding has become very general and the Government and many large corporations follow this method almost entirely. Under this system the inspection is very important. It is essential that the manufacturer of a high-grade product should be protected from the manufacturer of low-grade goods who has no reputation to sustain, and whose sole aim is to make as much profit as possible on each contract. Rigid but sensible inspection affords such protection. Good inspection, however, does not mean blind adherence to all of the details of the specifications. Minor flaws exist in almost every specification. It is not possible always to cover every point in a specification, and the more complicated the machine or the larger the work, the more difficult it is to cover all essential points and the more likelihood of inessential requirements being included.

Blind adherence to nonessentials often works a serious hardship on the manufacturer, causes delay in delivery, and frequently results in the buyer getting a poorer article than he would otherwise have obtained.

A good inspector knows the difference between essential and nonessential requirements, and having confidence in himself, is quick to waive nonessentials to meet the desire of the manufacturer to use a standard pattern, or a standard form of construction. The incompetent inspector feels that his only safety is a rigid adherence to the letter of the spec-

ifications, and he insists on nonessential requirements, which may force the manufacturer to special construction and new patterns.

We have heard much complaint against the latter type of inspection, and the Government appears to be the greatest offender.

Officers are appointed as inspectors who have little or no knowledge of the work they are to inspect. These officers are unable to determine the essential and the nonessential requirements, and to protect themselves, insist upon a rigid adherence to the specifications in every detail.

In many cases in the machinery business, manufacturers ship machines which fulfill every essential requirement of the specifications, only to have them rejected for noncompliance with some trivial requirement. Government contracts are so drawn that the seller has few rights and no redress. Unless the seller can convince the inspector that the point involved is of no consequence, the requirement must be met, no matter how great the cost and delay.

The Government should provide competent inspectors who realize that blind adherence to specifications is not good inspection.

## Oil Swindlers Still Busy

During the past 11 years a certain oil-swindling game has been practised in this country with more or less success, and we are now advised that Canada has recently been made the field of endeavor. The game is an old one and has been exposed in these columns many times.

Fink & Son was the last firm name and their cards have borne the names of various cities as headquarters. They have a mixture for saving and improving all kinds of oils. One gallon of a certain mixture, combined with one gallon of oil will make a better lubricant and go further than two gallons of oil; and the mixture costs only 10 cents a gallon.

Without any warning, AMERICAN MACHINIST readers would think twice about a proposition of this kind, and with this introduction for our old time friends, they shouldn't have to think at all.

And there are several variations to the game, so Canadian readers please take notice.

## Shortages in Shipments

One of the annoying things, after a machine tool has been delivered, is to receive a letter claiming that such and such parts were short when the machine was unpacked. It is doubly annoying, for most manufacturers are very careful and particular to check over all the parts of a shipment before it is prepared for the carrier. Double checking is common, and even triple checking is sometimes used, particularly with foreign orders. Failure on the part of the purchaser to find all of the parts listed with the shipment is often due to carelessness in unwrapping or investigating all of the wrapping materials, and sometimes to a failure to recognize the parts from the names and descriptions on the schedule.

A prominent manufacturer recently said in this connection: "Whenever a claim is made for shortages, I always send the parts asked for and then instruct my demonstrator to hunt around for those parts when he starts the machine and ship them back to the factory. They are invariably returned by this method, at, of course, a slight expense and a certain amount of trouble."

All of this justifies a word of caution to investigate a shipment most carefully before making a claim for shortage.

## New Publications

WORK ACCIDENTS AND THE LAW. By Crystal Eastman. Charities Publication Committee, New York, 331 pages 6x9 inches. Price $1.50, or $1.65 mailed.

This book presents the findings of the first systematic investigation of the number and the causes and the effects of a year's accidents in a representative manufacturing district, and the record cannot fail to recall Hood's memorable regret "that bread should be so dear, and flesh and blood so cheap." The record, shows that 526 men were killed by work accidents in a single year, most of them clearly preventable and in no wise the fault of the victim, yet there were comparatively few cases where the dependents in any way were provided for.

But the book is more than a record of suffering caused by unnecessary accidents and inhuman disregard for the unfortunate. Nor is it written with a view of antagonizing or of fostering class feeling. It is rather a calm, judicious review of the facts revealed by over a year's careful investigation, with a spirit of helpfulness in the way of suggestions for improvement, that does credit to the fair mindedness of the author.

Accidents in railway work, in mining, the steel mills and other lines are carefully considered and some rather startling facts are brought out. Fewer miners are killed by explosives than from any other cause; electric shock and cars in mines both claim more than powder, while improperly supported roofs heads the list of accidents.

In the steel mills and other large work the overhead crane is the great man eater; the breaking of chains, the slipping of the load and other mishaps footing up an all too gruesome total.

Under suggestions for prevention we find that "employers reckon with the responsibility to prevent accidents just about as fast as the conscience is aroused on the subject" which is followed by an account of the excellent work done by the United States Steel Corporation through its "Committee on Prevention." Some of their safety devices are illustrated and this company is credited with being among the most careful and progressive of large employers in the United States.

The section dealing with the economic cost of work accidents should have careful consideration. The analysis of the way the losses are distributed on those least able to bear them and the effect on the standard of living and the taking of children from school, is carefully done and sets one to thinking far deeper than is apt to otherwise be the case. And it is easy to see that this becomes a direct loss to the community and affects us all in some way. This loss in one year, footed up to $5,228,726 in Allegheny county alone.

The problem of the injured workman who must struggle on to help support his family as best he can also receives attention and leads up to the policies of certain companies in aiding mutual benefit associations and similar institutions. A peculiar situation exists at the Carnegie Steel Company, where the company is shown to be far from liberal, but the injured men are helped by the Carnegie Relief Fund (a personal gift of Andrew Carnegie), even where they have won suits against the company.

The final chapters of the book deal with the law of accidents, employers' liability and the plans in use by some well known firms for prescribed compensation for those injured or killed. It is a splendid reference book for the employer as well as the student of sociology and is full of constructive criticism which is sure to benefit all concerned.

## Personals*

P. Ridderhof, formerly identified with the Wilmarth & Morman Company, Grand Rapids, Mich., has assumed the management of the Zono Manufacturing Company, Pasadena, Cal., manufacturing check protecting instruments.

Henry O. Evans, until recently mechanical engineer with the Detroit Valve and Fitting Company, is to establish in business for himself in Philadelphia, marketing automatic independent reaming and tapping machines of his own design and invention.

George H. Buckley has resigned as general foreman and employment manager with the Long Arm System Company, Cleveland, Ohio, to accept position as assistant general superintendent of the Salisbury Wheel and Manufacturing Company, Jamestown, N. Y.

*Items for this column are solicited.

# New Tools and Shop Appliances

## A Connecting Rod Drilling and Facing Machine

The Hoefer Manufacturing Company, of Freeport, Ill., has designed a special machine for drilling and facing automobile connecting rods without the necessity of changing the rod in the jig, nor changing the tools or drills.

The machine consists principally of two adjustable heads gibbed to a solid bed. One of these heads carries the drilling spindles for both the large and the small ends of the connecting rod. The other head has two spindles in which are placed the facing tools for the ends of the rods.

The connecting rods are placed in a trunnion jig which has hardened-steel jaws operated by a quick-releasing screw. These jaws clamp the rod firmly during the operations of both drilling and facing, as but one setting of the rod in the jig is necessary to complete it. After the machine has been set, the eccentric lever on the two projecting arms is locked, giving additional support to the rod for high-speed drilling. The small end of the connecting rod is drilled first by throwing in a power feed lever. While the drill is removing the stock, the operator, by means of the two hand wheels shown in the front view of the machine, faces the ends of the large end and, as the cutters face concentric with the holes, a very desirable finish is secured.

**ANY and all new or improved machines, tools, or shop appliances of interest to men responsible for results in machinery-making plants will be briefly illustrated and described here—the machine shop news.**

**A more full and detailed description will be given—when it is real news—if it can appear here first—before it is sent to other papers. All descriptions appear in ALL four editions of the paper—Weekly, Monthly, Weekly English and Weekly German.**

operator faces the small end; and as the spindles are in alinement with the trunnion jig, which carries the connecting rod, accuracy is assured.

In each end of the trunnion is placed a hardened adjustable positive stop for the facing tools, and each end of the rod adjustable for connecting rods from 10 to 14 inches long.

In ordinary connecting rods, it requires about five minutes to drill and face both ends; this time includes picking up the rod, fastening it in the trunnion jig, and taking it out of the jig.

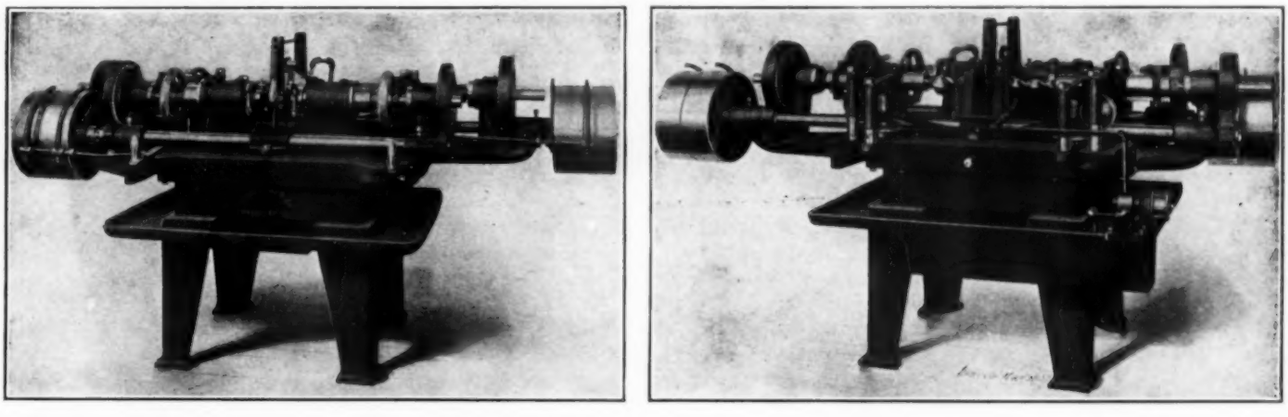
As there is but slight variation in the holes of ordinary connecting rods, the machine was designed for but one speed and one rate of feed.

## A Planer Elevating Device

The Cincinnati Planer Company, Cincinnati, O., has brought out the power elevating device shown herewith. The

A Planer Elevating Device

device is controlled by the lever at the left which enables the operator to raise the rail at slow speed and lower it at almost double speed. The stand is bored out and fitted with bushings in such a manner that the top shaft which carries the pulley can be withdrawn with the bushings intact and inserted from the other side, so that when making various styles of drives, which are sometimes complicated on account of the odd dimen-



Connecting Rod Drilling and Facing Machine

When these operations are completed, the eccentric lever is opened and the trunnion is swung 180 degrees against an adjustable positive stop. After clamping the ends of the rod again by means of the eccentric lever, and then by throwing in the power feed of the large drill spindle, the large end is drilled while the as it is swung from one position to another, carries with it its own stops, so that when once set, all dimensions are duplicated.

The spindles are made of crucible steel running in bronze-bushed bearings, and are back geared. The two heads carrying the drill and facing spindles are

sions of motors, the pulley can be used on either side. As the power elevating device is used but very little it has been designed so that the pulley and top shaft are the only parts revolving, all of the gears being idle, when not in use.

## A New High-speed Wood Screw Threader

The accompanying cuts show front and rear views of the new wood screw threader brought out by the E. J. Manville Machine Company, Waterbury, Conn. It is one of a complete line of machines for the manufacture of wood and machine screws from blanks made by the cold-heading process on its line of cold headers, or rivet machines.

The special features of this machine are numerous. The frail, springy rotary fan hopper with its irregular and uncertain moving pickup arm has been replaced by a new type of grooved-blade fan hopper, which is rigidly mounted and braced, in which the movements are positive and steady, overcoming the snapping of the pickup arm and scattering screws on the floor or in the gears of adjacent machines. The track from the hopper to the cutoff fingers is adjustable for different diameters of screws and the cutoff lever is rigidly mounted directly in line with the end of the track instead of reaching around from the back of the track, like the old type of springy cutoff, which has never been satisfactory.

The hopper blade is operated by a friction device which can slip in case anything gets caught, and is provided with a comb or scavenger which throws all oversize, or misplaced screws back into the hopper. This complete feed mechanism, as shown, is mounted on a single rigid bracket so that a few of these extra feed mechanisms may be carried in stock for different-sized screws and, when it is desired to change the machine from one size to another, the entire feed can be removed and a new one set in its place by loosening two screws which fasten the bracket to the frame.

The cutoff fingers and pickup fingers are made of sheet steel and carried in stock. The back rest, which has always been a source of trouble by the screws and chips collecting behind it, is fully protected, so that this is impossible. The spindle will hold large or small screw heads with an even grip, thereby overcoming broken tools and crushed heads.

The gripping dies are round and counterbored from the back, so that they may be replaced or changed without removing the spindle from the machine. They present their gripping surface to the underside of the head, the top of the head being backed up by a plunger which is adjustable from the rear end of the spindle by means of a set screw and lock nut. This enables the operator to keep the jaws at their most powerful gripping position.

The tool post is short and rigid and carried on a hollow tool bar, inside of which is mounted the returning spring which, owing to its direct action and its use for this single purpose alone, is many times lighter than the old heavy springs, pulling at an angle at the front of the machine. This, together with the stop collar on the tool bar to receive the bump of the return overcomes broken cams and gears, which in the old machines are of frequent occurrence.

The rock lever for rocking the tool in and out of the work is evenly balanced, so that a very light spring is used for rocking and holding the follower stud against the forming shoe, overcoming the severe wear which has always been a source of much inconvenience.

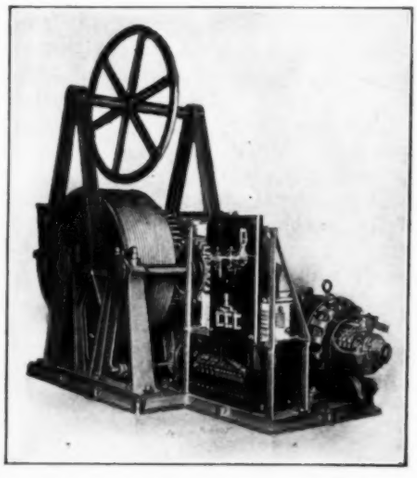
The forming shoe, as shown, is located where it is easily accessible and may be quickly removed or adjusted, the adjustments being horizontal, vertical and also inclinable for giving the tool proper guidance for cutting a perfect head, whether the back rest be perfect or worn. The back rest, itself, may be rocked sideways to take up wear caused by the point of the screw wearing in more than the shank.

The pointing tool is carried on a long, stiff, well supported bar and is easily adjustable for giving a perfect point. The pointing is done against the back rest and not with a box tool or hollow mill, thus enabling the threading tool to start threading before the pointing tool is through its operation.

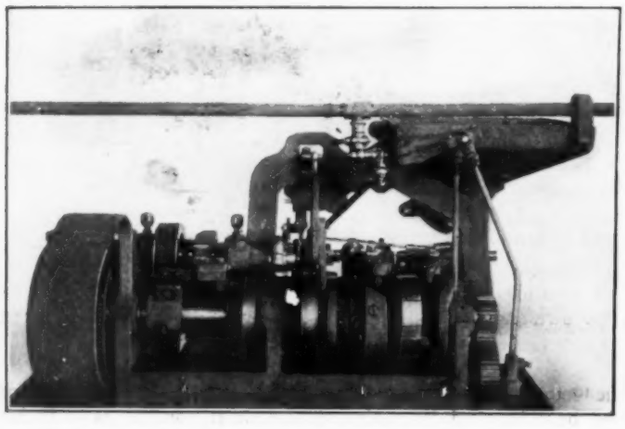
In general, yielding movements are provided wherever necessary to insure against breakage. All wearing surfaces, subject to severe use are hardened and easily replaced. The gearing is accurately cut and thoroughly protected by a suitable gear casing. All the bearings are provided with bushings to facilitate repairs.

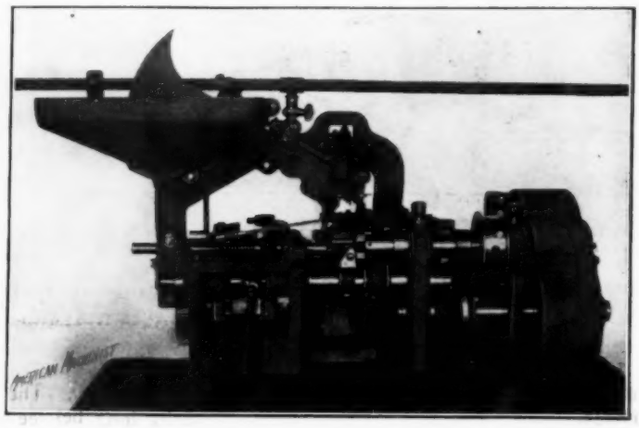
## An Electric Freight Elevator Installation

The accompanying illustration shows a simple compact electric-elevator power equipment. The cable drum, the controller, and the motor can all be so placed together as to occupy very little space. Two of these freight elevators were re-



AN ELECTRIC ELEVATOR INSTALLATION





A HIGH-SPEED WOOD SCREW THREADER

cently installed at the Charleston Navy Yard by John B. Adt, Baltimore, Md. Each machine has a capacity of 5000 pounds and weighs 12,000 pounds net.

The hoisting machine is of the tandem worm-gear construction. The bronze worm wheels engage each other and right-and-left worms placed tandem on one shaft in a double housing. As the thrust is absorbed in the right and left worms, thrust bearings are not necessary. The worms are submerged in oil. Spur gears transmit the power to the winding drum. An effective brake is attached to the worm shaft. Automatic terminal stop appliances, as well as a slack-cable device, are attached to the front of the worm-gear housing, where they are all readily accessible for adjustment.

A Westinghouse type HF 15-horsepower reversing induction motor, designed to operate on a 3-phase 220-volt 60-cycle circuit, is direct-connected to the worm shaft and runs at 860 revolutions per minute.

## A Tool and Die Grinder

The halftone shows a new die and tool grinder which has been put on the market by the Baird Machine Company, Oakville, Conn.

The spindle journals are tapered and

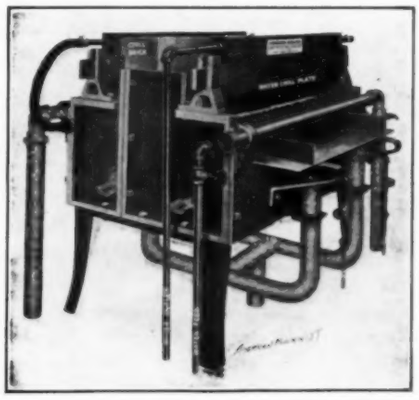
A Tool and Die Grinder

run in single piece adjustable bronze boxes.

The table is counterbalanced and is quickly adjusted to approximate hight; fine vertical adjustment is obtainable by means of the small handwheel under the end of the table. The equipment consists of two emery wheels, wrenches, water tank and countershaft.

## A Bolt Heating Forge

The halftone shows a forge (fired with either oil or gas and air), which has been brought out by the Monarch Engineering and Manufacturing Company, Baltimore, Md.

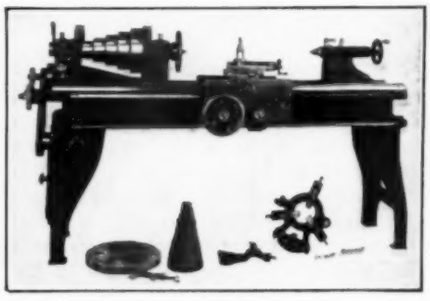


A Bolt-heating Forge

Owing to the construction, the bricks are readily replaced when burnt out. The arch is arranged to act as a retainer for the brick forming the arch over the heating space and also as a protector for the operator. The same concern also builds a line of rivet forges.

## A 14-inch Engine Lathe

This lathe is of New England type and is adapted to manufacturing as well as tool-room work. It is manufactured by the Rockford Lathe and Drill Company,



14-inch Engine Lathe

Rockford, Ill. The headstock is especially long between the bearings and is fitted with a five-step cone of wide face, giving high power. The bearings are large and these two features tend to avoid chattering.

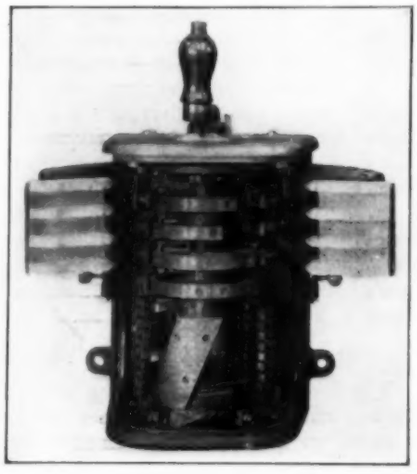
The tailstock is of offset type, so that the compound rest can be thrown around to 90 degrees. The lever for tightening the tailstock makes it possible to move forward or back quickly without the use of a wrench. There is, however, at the rear of the tailstock a clamping device by which it can be securely fastened for heavy duty by tightening the nut which eliminates all slip.

The carriage is of heavy pattern and has a new and special guide underneath the center, which acts as a support and insures a steady cut without chatter. The apron is of heavy design and has a double inside bearing for all shafts. The cross slide has a special new locking nut, which makes it possible to quickly lock the compound rest or tool slide at any point along the screw, and when using taper attachment it is only necessary to loosen this nut.

The feed is belt driven, operating through a gear box with three changes, controlled instantly by lever, making six in all with a two-step cone. The bed is of heavy box pattern, well ribbed, and is arranged so that taper attachment can be applied at any time. The lathe is well adapted for tool-room purposes, as it will cut from one to 92 threads.

## Drum Type Controller for Machine Tools

The halftone shows one of a line of controllers built by the General Electric Company, Schenectady, N. Y. These con-



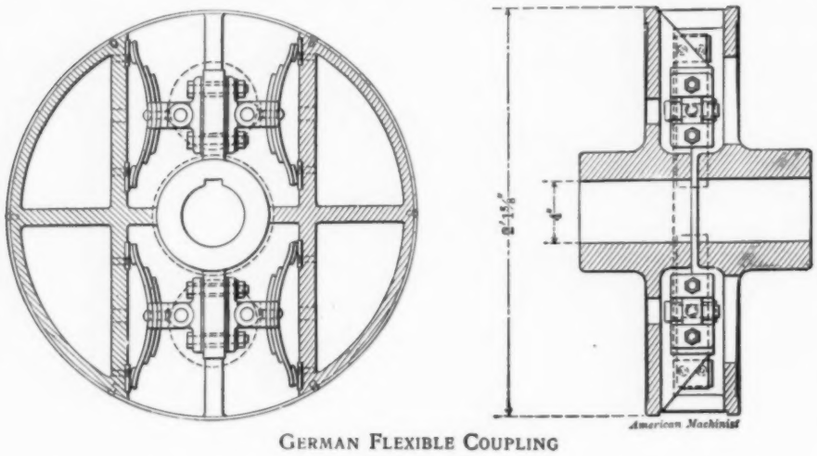
A Drum-type Controller for Machine Tools

trollers are especially applicable to machine tools. Sheet-iron covers lined with asbestos are provided to protect the live parts from dust and injury.

## German Flexible Coupling

The flexible coupling illustrated herewith was invented by W. Beilke, of Berlin, and manufactured by Hesselbein & Reygers, of Bocholt, Westphalia, Germany. It is claimed that by the design the usual objection of requiring excessively large parts for even moderate powers, as in most devices of this sort, is avoided. It is intended that these couplings shall be suitable also for very large powers and for transmitting 30,000 horsepower, as in a turbine plant, the maximum diameter is said to be not over 8 feet 3 inches.

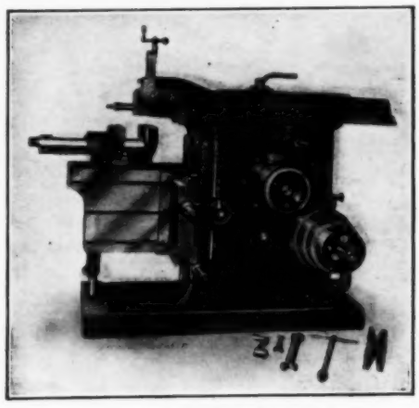
It will be seen that the power is transmitted from one member to the other by four sets of leaf springs, each of these being swung at its middle point, so as to distribute the pressure evenly on the two free ends of each spring. These ends bear upon special plates screwed into the casting. It is claimed that this style of spring not only gives great elasticity, but the friction resulting between the parts when they give, is supposed to absorb the recoil of heavy shocks. By the insertion of insulating material the two parts of the coupling may readily be insulated from each other.




GERMAN FLEXIBLE COUPLING

## A Back-geared Shaper

The halftone shows a shaper built by Lutter & Gies Company, Milwaukee, Wis. The table can be swiveled at an angle for tapered work. An opening under the ram permits long shafts up to 3 inches diameter to be passed through for keyseating. The back gears are thrown into or out of engagement by a lever at the back of the machine. All feed screws are provided with dials reading to thousandths.



A BACK-GEARED SHAPER

# The Society for Testing Materials

The thirteenth annual meeting of the American Society for Testing Materials was held at Atlantic City, June 28 to July 2, with an attendance and registration the largest in the history of the society; about 350 members and guests were listed in the final registration booklet.

The annual report of the executive committee showed a satisfactory net gain in the membership of the society during the past year. The total membership at present is 1280.

In this brief report no attempt will be made to treat of all of the sessions, papers and reports. A few subjects that are of especial interest to the machine-building industry will be taken up.

### MEMORIAL SESSION FOR DOCTOR DUDLEY

The evening of June 29 was devoted to a memorial session in honor of the memory of Dr. Charles B. Dudley, late president of the International Association for Testing Materials and of the American Society for Testing Materials. Tribute was paid to him as a railroad man, as a chemist, as a metallurgist, as a mentor, as a citizen, and as a personal friend. In closing, a minute was adopted by the society recording at once the deep grief and deeper gratitude of the members; grief at the loss of a great leader and friend, and gratitude at the privilege of having been led by such a master.

### STANDARD AUTOMATIC SCREW STOCK

The report of committee A-8 on standard specifications for cold-drawn steel is of particular interest from the fact that it deals with what has been tentatively described as "standard automatic screw stock."

During the last year this committee has organized and is carrying through to completion a number of tests to discover a cold-drawn stock adapted to the high-speed production of parts on automatic screw machines. Some five or six steel producers have furnished material for these tests, this material being of a kind best suited in their judgment for the purpose intended; this material has been ordered without any formal specification whatever.

Some five or six manufacturing firms have put this steel into use, are carefully watching its performance and are rendering formal reports to the committee. It is expected that at the annual meeting of next year a report will be rendered embodying a recommendation for a standard specification for this class of material.

Following is the report of this committee and the accompanying blank shows shows the nature of the information that is being furnished in regard to the various steels that are under tests.

We call particular attention to the last paragraph of the report in which the committee asks for suggestions or data that will be of value to them in their investigations.

### REPORT OF COMMITTEE A-8

"As briefly outlined in report of last year, your committee has undertaken a series of tests with special reference to the class of material which we have tentatively described as 'standard automatic screw stock.' In pursuance with an arrangement made at a meeting of the subcommittee, held at the last annual meeting of the society, the various consumers represented on the committee placed orders with each of the producers for cold-drawn steel for automatic screw-machine work, for test purposes, this material to represent the various types of

AMERICAN SOCIETY FOR TESTING MATERIALS

COMMITTEE ON COLD DRAWN STEEL

RECQRD OF TESTS.

MACHINING TEST OF STEEL FOR COMMITTEE A-8 MARKED NO. CAM BLACK.

Test made by — Date
Steel Mfd. by — Size (nominal)

PROPERTIES OF STEEL.

| *Chemical.* | *Physical.* |
|---|---|
| Carbon | Max. Tensile Strength |
| Manganese | Elastic Limit |
| Phosphorus | Elongation |
| Silicon | Contraction of Area |
| Sulphur | Size (actual) |

DETAILS OF MACHINING.

Kind of Machine — Machine No.
Part Made from Steel
Kind of Cutting Lubricant
Forming Tool — Steel-hardened at Deg. F.; Drawn at Deg. F.
Remarks
Threading Tool — Steel-hardened at Deg. F.; Drawn at Deg. F.
Remarks
Cutting-off Tool — Steel-hardened at Deg. F.; Drawn at Deg. F.
Remarks
Cutting Speed F.P.M. Forming — Threading — Cutting Off
Speed R.P.M. Forming — Threading — Cutting Off

RESULTS.

Output in Pieces per Grind — Pieces per Hour
Condition of Finished Pieces
Condition of Tools
No. of Pieces Inspected
No. of Pieces Passed — Per Cent. Loss
Steel Machines Hard — Soft — Tears
Steel Contains Hard Spots — Is Seamy

REMARKS.

The — considers this steel

Signed.....

FORM ON WHICH DATA IN REGARD TO TESTS OF AUTOMATIC SCREW STOCK ARE RECORDED.

material proposed for this grade of service.

"This material (making a total of about twenty tons) was made up specially by the producers in accordance with the size requirements, etc., of the various consumers, and thorough and systematic tests have been under way with this material. Unfortunately for the work of the committee, the press of business came about the time the orders were placed for the test material, and caused very considerable delays in getting out the material for the tests. In fact, some few lots are still undelivered, these being ordered nearly a year ago. The tests made by the consumers were handicapped by the same rush of business, and also by the fact that the material from the various producers was received for the most part with relatively long time intervals between. While the data obtained by these tests have not as yet been entirely collected and tabulated, results of very considerable value relating to this work are in hand, and your committee confidently expects to arrive at some definite conclusions in regard to this subject before another annual meeting.

"The tests undertaken include careful chemical tests, physical tests and tests for machining quality under various conditions and machining speed, with complete record of tools used, pieces made, etc., with a view of arriving at a specification for the best commercial grade of steel for the purpose indicated.

"The committee will very much appreciate any suggestions or data which any of the members of the society may have to offer in connection with this subject, with a view of taking into account all the possible conditions governing specifications for this class of material."

## The Slide Rule and the Index Table

The draftsman was young, ambitious and possessed a college diploma and a few months' experience on gas-engine design. He was turned over to the tool-designing department as a borrowed man to work a special machine tool.

After the design had progressed for some ways it was thought best to prepare a table of the gears to index for the entire range of work that was to be done on the machine. The draftsman in his enthusiasm took this job home one night and the next morning brought in a long, neatly worked-out table of the index gears.

The chief looked it over and complimented the young man on the job, saying that it must have taken him most all night to work out all the combinations. What was his surprise to be told "Oh! no. It only took a couple of hours. I used my slide rule."

In a gentle way the chief began to question the accuracy of the table and was told "I know those figures are right within a small per cent. of error." But a little old-fashioned figuring showed that while a few combinations were right for the number of holes to be indexed, most of them were from 1 to 4 holes off.

All of which goes to show that one should not "guess" when figuring an index table and that there is some use still for the multiplication and long division of our fathers.

# A Talk on Shop Questions

By W. D. Forbes

Now that I have got you, proprietors, managers, etc., where I can hold you I propose to take a text and proceed to preach you a sermon, which, however, will be short. The old text about a prophet and his honor we will now translate in this way: "A superintendent has little power with the boss."

There was a certain man who had a manufactory and was behindhand in delivering his goods. His trouble he said was that, when a rush job came in, his grinder belts broke and much time was lost and much profanity provoked, and he noted that at no time, except when there was a rush, did his grinder belts give him trouble. So he did not think the matter out or even remember that he had a superintendent, but wrote to a belt expert, who advertised widely, and received his answer saying no doubt he could save him a lot of money, as he knew all about belts and $250 was his fee. So he was sent for, and came and saw, and changed things. All the grinding-belt pulleys, he said, were too narrow and at great expense and some interruption of the work, the grinder pulleys were widened and no more breakage occurred and the proprietor smiled, and while he mourned the money spent, he could now get out his work on time. Selah!

One day this proprietor went on a short journey to a shop where the self same size and make of grinders were in use and, lo and behold, the belts on them were just the size of those he had discarded on his own machines, and yet they gave no trouble.

Now to the proprietor's mind there came many thoughts and ponderings and on his return home he called in his superintendent and told him what he had seen. The superintendent looked upon him with a fishy eye, said nothing but sighed. Then the proprietor asked how could the superintendent account for their having many troubles and the other people having none. Whereupon the superintendent braced himself and said:

"I know the reasons that account for the facts. I told you a year ago, and you have a letter from me on the subject, but you did not think I knew what I was talking about and I expected to get fired. Now, here I will show you a price list of belting: from it your purchasing agents get a discount of 70-10-5-2 per cent. I drew your attention to the large discount and said that good short-lap belt could not be bought at the price. You saw your purchasing agent, who went after the belt salesman, who smilingly told him, while short-lap belt made by his rivals and by himself could not be bought at such a discount, his firm's belting was so much better than that furnished by his rivals, that there was no use of his buying from anybody else at 45 off, and that settled it with you, and you kept on buying at the big discount and you had your troubles.

"Now, the men soon found that, if they ground their work to the utmost, the belts gave out, so they went light when there was no rush, making all sorts of excuses, but when the rush came, they *hustled* and, of course, the belts broke. I did not know you had sent for a belt doctor until he was here and you let him spend money to an

amount which you would not think for a moment of letting me spend because, 'A prophet has no honor in his own country.' You thought you knew how little I knew about belts; you did not know anything about the belt doctor, but like many of us, you believed in printers' ink and paid for your belief."

Now, I know that if a person devotes his entire time to a subject, the results should be a better knowledge than if only an occasional thought is given to it, but I feel a superintendent should be first consulted before an expert is called in. I know that in the case cited the grinders were made by a company which has manufactured nothing else for years. They have concentrated their thoughts and have had a vast experience and, as with the belt doctor, it was only naturally supposed that the grinders were made right and the belts were at fault. If this had not been the case, the grinder company could not have continued in business.

Now, gentlemen, this sermon is not meant for any of you, but only to illustrate how very foolish other people are. The collection will be omitted, and the doors are now unlocked. I shall be glad to see you again here soon, as I have more to tell you about the foolishness of other people. Amen.

# Increasing Shop Capacities

## Metal Working

**News items for the sales department—where more equipment will be needed. Authentic news is solicited for this department, not rumors or gossip—facts.**

G. White & Sons, London, Ont., engine builders, are erecting a new plant.

Dahl Brothers, Williston, N. D., will erect a blacksmith shop at Springbrook, N. D.

The plant of the Puget Sound Sheet Metal Company, at Seattle, Wash., was burned.

The Racine (Wis.) Brass and Iron Company will build an addition to its foundry.

Emil Krogh and John Helgeson, of Rothsay, Minn., will erect a blacksmith shop.

H. B. Ferguson's blacksmith and wagon shop at Huron, S. D., was destroyed by fire.

W. C. Smart, Franklin, Mass., has purchased site on which he will erect a brass foundry.

The American Metal Screen and Rack Company, Detroit, Mich., will erect a factory building.

The Caldwell & Watson Foundry Company, Birmingham, Ala., will erect a new $25,000 foundry.

The Grey Iron Foundry Company, Reading, Penn., is erecting a new three-story building.

The Janesville (Wis.) Machine Company has commenced the erection of a four-story addition.

The Merkel Light Motor Cycle Company, Pottstown, Penn., will erect an addition to its plant.

The Elgin, Joliet & Eastern Railroad will spend $1,000,000 in enlarging its shops at Joliet, Ill.

The Moon Motor Car Company, St. Louis, Mo., has completed plans to erect a four-story plant.

The American Fork and Hoe Company will build a four-story addition to its plant at Geneva, Ohio.

Chas. Leonhardt, of New Ulm, Minn., is considering the erection of a foundry and machine shop.

The plant of the Illinois Steel Company, Gary, Ind., was damaged by fire, causing considerable loss.

The Chicago, Burlington & Quincy Railroad has issued a list of tools required for shops at Havelock, Neb.

Bids are now being received for the construction of ordnance shop at Fort Constitution, Portsmouth, N. H.

W. C. Norris, Tulsa, Okla., needs a forging machine, small power hammers and engine lathes for his machine shop.

The Interstate Heater Company, 403 Long avenue, Cleveland, Ohio, is desirous of securing site for a new plant.

The Southwest Universal Pump Company, Kansas City, Mo., will establish a plant. Offices are in the Postal building.

The plant of the Diamond Creamery Company, Monticello, Iowa, was destroyed by fire. Loss, $75,000. Will be rebuilt.

C. E. Northrop, Thorsby, Ala., contemplates the establishment of a plant for the manufacturing of dentists' tools.

J. R. Nolin, of Joplin, Mo., will establish a factory at Dallas, Tex., for manufacturing pumps for irrigation purposes.

The Leedy Manufacturing Company, Indianapolis, Ind., making musical instruments, will erect an addition to its plant.

The Los Angeles (Cal.) Steel and Malleable Iron Company is endeavoring to secure site on which to erect a new plant.

The Kells Foundry and Machine Company, Adrian, Mich., is contemplating the removal of its plant to some other locality.

The La Salle (Ill.) Machine and Tool Company is enlarging its machine shop and contemplates adding some new equipment.

The Taylor Steel Company, Plain City, Ohio, will erect a plant in Springfield for the manufacture of crucible-steel forgings.

The Alpena (Mich.) Motor Car Company, capitalized at $450,000, has secured site and will erect plant. D. D. Hanover is president.

The Seneca Chain Company is having plans prepared for a new plant at Kent, Ohio, to replace the one burned some time ago.

The Sternburg Manufacturing Company, Milwaukee, Wis., has purchased site for a new plant for the manufacture of automobile trucks.

The Milwaukee (Wis.) Metal Bed Company is planning extensive additions and alterations, which will more than double its capacity.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids July 19 for cutting-off machine as per Schedule 2650.

The Tedford Auto Company, 210 West Fourth street, Little Rock, Ark., is said to be planning the erection of a modern automobile factory.

The Greenville Motor Products Company, Inc., will move its plant from Jamestown, N. Y., to Greenville, Penn. Machine tools will be required.

H. Thomas, locomotive superintendent, Arica A La Paz, Arica, Chile, would like to receive catalogs of railway-shop tools, rolling stock and supplies.

The Pneumatic Scale Company, Norfolk Downs, Mass., is erecting a two-story addition to its plant. The compay makes automatic-weighing scales.

The F. A. Brownell Motor Company, Rochester, N. Y., manufacturing gasolene engines, has secured a permit for the erection of an addition to its factory.

The Gramm Motor Car Company, of Bowling Green, Ohio, is negotiating with the Chamber of Commerce, San Antonio, Tex., with a view of locating there.

The Hupp Yeats Electric Car Company, Detroit, Mich., recently incorporated for $100,000, will soon commence the erection of a factory at 345 Bellevue street.

The plant of the Brammer Manufacturing Company, Davenport, Iowa, making washing machines, was burned, causing a loss of about $150,000. Plant will be rebuilt.

The Collinge Taximeter Company, Room 502, World building, New York, is endeavoring to find suitable site for a new plant to replace its present one in Connecticut.

Case Bros., Smithport, Penn., whose cutlery plant was recently burned, have plans under consideration for removing to some other locality and rebuilding its plant.

The M. H. Treadwell Manufacturing Company will move its plants from Lebanon and Myerstown, Penn., to Easton. The company manufactures heavy machines, cars, etc.

Jesse O. Wells, president of the L. J. Wells Livery and Auto Company, Des Moines, Ia., is said to be interested in the erection of a new auto factory on site still to be secured.

The Bunting Brass and Bronze Company, Alliance, Ohio, will commence work within a few weeks on its new plant, which is to consist of a main foundry and a machine shop.

The Pacific Electric Railway Company, Los Angeles, Cal., is planning the construction of additional shops for the building of its cars, which are at present secured in the East.

The Fayette Plumb Company, Inc., of Philadelphia, Penn., has secured a permit for the erection of its $1,000,000 plant in St. Louis. The company manufactures edged tools, etc.

The Ona Hook and Eye Manufacturing Company is planning to remove its plant now located at Sunbury, Penn., to some other place. The company has offices at 58 Pennington avenue, Trenton, N. J.

Charles Miller, automobile manufacturer, Hazleton, Penn., is said to be interested in the organization of a new company for the purpose of establishing a large and modern new factory in the Middle Atlantic section.

The New York Central Iron Works Company, 150 Nassau street, New York, is investigating throughout the Middle Atlantic section with a view of securing site for a plant for the manufacture of heating boilers.

Charles H. Noyes, managing director of the Noyes Manufacturing Company, is looking for site in Omaha, Neb., on which to locate a plant for the manufacture of lifting jacks. Can be addressed, care of the Murray hotel.

## General Manufacturing

Olaf Bangs, Harvey, N. D., will build a feed mill.

The town of Thornton, Tex., will install a water plant.

Cobb & Elliott will build a grain elevator at Lockney, Tex.

The sawmill of Jas. McCollum, at Corona, Minn., was burned.

Kingston, Okla., will erect an electric-light, ice and water plant.

The city of Clearwater, Fla., is preparing to erect waterworks.

The Detroit (Mich.) Creamery Company will erect a new plant.

The Haddonfield (N. J.) Water Company is building a new plant.

The Farmers Gin Company will build an oil mill at Waxahachie, Tex.

Fire destroyed the Milo Paper Mill, Penn Yann, N. Y. Loss, $30,000.

Fire destroyed the Copping sawmill at Joliette, Que. Loss, $75,000.

The Thad-Moody Lumber Company will build a mill at Kingston, Okla.

The Gilt Edge Creamery Company, Owatenna, Minn., will erect a plant.

The plant of the Finlay (N. D.) Tow Company was burned. Loss, $10,000.

Fire destroyed the sawmill of Charles Mitchell, at Powassan, North Bay.

The Coshocton (Ohio) Paper Company is erecting a large addition to its plant.

Taits lumber mill, at Aldergrove, B. C., was destroyed by fire. Loss, $40,000.

The electric-light plant and waterworks at Granite Falls, Minn., will be improved.

The J. B. Terry box factory, at Bella Vista, Cal., was burned. Loss, $45,000.

The engine room at J. Johnson's planing mill, Erie, Penn., was destroyed by fire.

W. F. Taubel, Riverside, N. J., will build a three-story addition to his knitting mill.

City of Fort Myers, Fla., will vote on issuance of $15,000 bonds for waterworks.

The Westover planing mill, at Alliance, Ohio, was destroyed by fire. Los, $15,000.

The Brompton Pulp and Paper Company is having new mills erected at East Augus, Que.

The sash and door factory of H. E. Willard, at Huron, S. D., was destroyed by fire.

The Stockton Water Works, Camden, N. J., will install a new pumping engine and boiler.

The plant of the National Roofing Company, York, Penn., was burned. Loss, $35,000.

The city of Manguin, Okla., voted to issue $25,000 bonds for extending its waterworks.

The town of Reidville, Ga., voted $8000 bonds for waterworks. J. V. Kelley, mayor.

Fire destroyed the plant of Tri City Plate Ice Company, Davenport, Iowa. Loss, $15,000.

David City, Neb., has voted $40,000 bonds for improvements to light and water plant.

A cheese factory will be erected on the farm of Hoelsay & Schaller, Pleasant Prairie, Wis.

The Pittsfield (Mass.) Electric Company will build a new $225,000 plant at Silver Lake.

The Jewish Hospital, Philadelphia, Penn., contemplates the erection of a new power house.

The town of Foraker, Okla., has voted $25,000 bonds for erecting light and water plant.

Lewis Feld & Co., Fourth and Race streets, Philadelphia, Penn., will enlarge its power plant.

The Dayton (Ohio) Airless Tire Company is looking for a suitable location for a new plant.

Geo. E. Snyder, of Memphis, Tenn., will erect a brewery and cooperage plant at Waco, Texas.

The plant of the Buckeye Reduction Company, Findlay, Ohio, was burned. Loss, $15,000.

The plant of the Iola (Kan.) Packing Company was destroyed by fire. Loss, $15,000.

The Pacific Mills, Dover, N. H., manufacturers of print cloths, will erect a new building.

The Rider Brass Company has selected a location in Bucyrus, Ohio, and will erect a foundry.

Frank E. Baker will install a central heating plant at Lewiston, Mont., to cost about $35,000.

The straw-hat factory of O. J. Powers & Son, Athol, Mass., was burned. Loss, $45,000.

The Gurney Refrigerator Company, Fond du Lac, Wis., will spend $25,000 in additions, etc.

J. A. Regan, of St. Paul, Minn., will build a $200,000 brick and tile plant at Winnebago, Minn.

The Webb Press Company will install a cotton-compress plant at Quanah, Tex., to cost $45,000.

The Crescent Bed Company, New Orleans, La., will erect a new three-story factory to cost $55,000.

The Wausau Paper Mills Company is preparing to erect a new sulphite department at Brokaw, Wis.

The Muskogee (Okla.) Oil Refining Company will spend $100,000 in improvements at its plant.

The Omaha (Neb.) Cold Storage Company is having plans prepared for a $150,000 cold-storage plant.

The El Paso (Tex.) Street Railway Company will increase its capital stock and make improvements.

The James Ingram sawmill, six miles north of Park Rapids, Minn., was destroyed by fire. Loss, $10,000.

The packing house of W. C. Temple, Winter Park, Fla., was destroyed by fire. Loss, about $60,000.

The Celluloid Company is building an addition to its plant at 31-35 Westcott street, Newark, N. J.

The dry house of the Connecticut Keys Process Company, at Palmertown, Conn., was destroyed by fire.

The plant of the Davenport (Iowa) Rendering Company was burned. Loss, $20,000. Will be rebuilt.

The Corn Products Refining Company, Granite City, Ill., will erect a six-story addition to cost $150,000.

The plant of the Newell Milk Company, Seattle, Wash., was damaged by fire to the extent of $10,000.

The Morley Button Manufacturing Company, Portsmouth, N. H., will erect an addition to its plant.

Diamond Alkali Company, of Pittsburg, Penn., will erect a $1,000,000 soda-ash plant in Painesville, Ohio.

Walter Baker & Co., Dorchester, Mass., manufacturing chocolate and cocoa, will erect a six-story addition.

The J. H. Kaiser Lumber Company will remove its box factory from Muscatine, Iowa, to Eau Claire, Wis.

Messrs. Prather & Jones, of Manchester, Ohio, are interested in the establishment of a new pearl-button factory.

Fire destroyed the plant of the Ehret Magnesia Manufacturing Company, Port Kennedy, Penn. Loss, $17,000.

The E. A. Staley Company, Decatur, Ill., will convert the old plant of the Platt Oil Company into a starch plant.

Fisher Bros., cabinet makers, New York, has purchased site in the Bronx, on which a new factory will be erected.

Dr. J. N. Pineault, of New Orleans, La., is considering the erection of a linen fiber plant at Red Lake Falls, Minn.

The Philadelphia Watch Case Company, Riverside, N. J., will build a new power house and install new engines.

The basket factory of the William Manufacturing Company, Northampton, Mass., was destroyed by fire. Loss, $150,000.

The Technical high school, Harrisburg, Penn., will purchase eight 12-inch motor driven lathes for the machine shop.

The New York Air Brake Company has awarded contract for the erection of a new machine shop at Watertown, N. Y.

The Clinton (Ill.) Gas and Electric Company will remodel its plant and will need new boilers, motors and generators.

The Dyer Land Company, Providence, R. I., will install an electrical-transmission system in its manufacturing building.

The Vancouver (B. C.) Power Company is planning to develop a 100,000-horsepower hydroelectric plant to cost $10,000,000.

The Pepperell Manufacturing Company, Biddeford, Me., manufacturing cottons, is building a large addition to its factory.

The St. Clair Provision Company, of Cedar Rapids, Iowa, is considering the erection of a cold-storage plant at Rapid City, S. D.

The Chicago Woolen Mills Company, 147 Fifth avenue, Chicago, Ill., capitalized at $150,000, is planning the erection of a mill.

The Severance Tank and Silo Company, Lansing, Mich., having outgrown its present plant, will look for a site for a new plant.

Swift & Co. will soon commence the erection of a $150,000 cold-storage plant on Hederson and Ninth streets, Jersey City, N. J.

C. A. Dodge, Ole Serumgard, and others, of Devils Lake, N. D., are interested in a company now being organized to erect a paper mill.

The Shenango & Mahoning Valley Light and Heat Company will spend about $300,000 in improving its power house at New Castle, Penn.

Messrs. Levin, Santa Rosa, Cal., whose tanning plant recently burned, is said to be endeavoring to find another site for a new plant.

The Lindsay Fence Company, Cleveland, Ohio, will erect a new plant on East Fortleth street for which plans are being prepared.

J. W. Gillis Company, Rochester, N. Y., making picture frames and moldings, will

erect a new factory and boiler house to cost $40,000.

The Wagener Brewing Company, Salt Lake City, Utah, has started the erection of a new building on Second South, near Third West streets.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids July 1 for installing boiler, etc., as per schedule 2651.

The Rudolph Wurlitzer Manufacturing Company, of Cincinnati, Ohio, will enlarge its plant at Martinsville. The company manufactures musical instruments.

The Roessler & Hasslacher Chemical Company, 100 William street, New York, is preparing to erect a plant at Perth Amboy, which is to cost about $600,000.

A. C. Hutcheson, of Charlotte, N. C., is forming the Altavista Cotton Mill, Inc., to have a capitalization of $300,000, which will erect a large cotton mill at Altavista, Va.

It is reported that W. J. Bowen & Son, of Nashua, Iowa, will soon award contracts for the construction of a dam, etc., in connection with the building of a hydroelectric power plant.

Superintendent Averill, of the Berkshire White Portland Cement Company, of Clayton, Mass., is said to be interested in the erection of a modern new plant in the State of Pennsylvania.

The Farmers Cotton Oil Company, Birmingham, Ala., a new concern, will erect a $100,000 cotton-oil mill at avenue F, between Seventh and Eighth streets. S. B. Brown is president.

The town of Leicester, Mass., will require two power pumps of about 280,000 gallons daily capacity to be direct connected to oil engines or motor driven. Address the water committee.

Proposals will be received by the Commission of Fisheries, Department of Commerce and Labor, Washington, D. C., until 2 p.m., July 26, for the construction of boiler and pump house at Fairport, Iowa.

H. M. Byllesby & Co., Chicago, Ill., has purchased the plants of the Grand Forks Gas and Electric Company, the Red River Power Company, and the Marcus Johnson Power Company, at Red Lake Falls, Minn., and will spend $1,000,000 in improvements.

Sealed proposals will be received at the office of chief of ordnance, War Department, Washington, D. C., until July 12, for furnishing steel filing cases for mechanical drawings, gallery for filing cases and one steel filing case in one or more units.

The Isthmian Canal Commission, Washington, D. C., will receive bids up to 10:30 a.m., July 11, for packing, friction clutch, pulley, steel, iron, copper tubing, steel tubing, taps, dies, milling cutters, pipe fittings, bolts, nuts, etc., as per Circular No. 592.

The Isthmian Canal Commission, Washington, D. C., will receive bids up to 10:30 a.m., July 19, for manganese tumblers and rollers, bushings, lag and set screws, engine indicators, steam traps, hose couplings, flanges, rubber valves, asbestos packing, etc., as per Circular No. 593.

The Navy Department, Bureau of Yards and Docks, Washington, D. C., will receive bids until 11 a.m., July 16, for two 100-kilowatt synchronous motor-generator sets, one 2½-kilowatt booster set and switchboard-controlling equipment. Plans and specifications can be had of the Bureau.

The Navy Department, Bureau of Supplies and Accounts, Washington, D. C., will open bids July 12 for one motor generator (schedule 2661), 47,000 pounds medium-steel angles, 3000 pounds solder, half and half, 20,700 pounds steel plate, 8700 pounds bar steel (schedule 2664), 41,100 pounds galvanized steel plate (schedule 2664), 3900 pounds steel angles, 21,750 pounds steel plate (schedule 2668).

## New Incorporations

Stella Aëroplane Company, New York. Manufacture aëroplanes. Capital, $50,000. Incorporators, D. Edelstein, I. Wolfberg, etc.

J. H. Ingersoll & Sons Company, Portland, Me. General canning business. Capital, $10,000. Jas. H. Ingersoll, Auburn, president.

Acme Indicator Company, Cleveland, Ohio. Manufacture indicators. Capital, $10,000. Incorporators, W. B. Whiting, J. Walsworth Sutphen, C. C. Owens, etc.

Pelletier Aëroplane Company, New York. Manufacture aëroplanes, motors, engines, etc. Capital, $25,000. Incorporators, H. E. Pelletier, E. J. Pierce, N. R. Green.

Livingston Radiator and Manufacturing Company, New York. Manufacture radiators etc. Capital, $150,000. Incorporators, W. S Lare, C. A. Bruce, T. Roberts, Jr.

Creston Hoop and Stave Company, Creston, Ohio. Manufacture hoops, staves, etc. Capital, $30,000. Incorporators, John M. Peel, George E. Whitney, W. S. Peel, etc.

Schneider & Goossmann Machine Company, Cincinnati, Ohio. Manufacture machinery and tools. Capital, $15,000. Incorporators, Fred Schneider, Fred Goossmann, etc.

Atlantic Wrench Company, Atlantic City, N. J. Manufacture patent wrenches, etc. Capital, $50,000. Incorporators, Martin Reinberger, Geo. Buchanan, Thos. White.

Weaver Concrete Product Company, Marion, Ohio. Manufacture concrete products. Capital, $10,000. Incorporators, C. T. Weaver, W. L. Casady, H. R. Young.

Gasport Motor Company, Gasport, N. Y. Manufacture gasolene engines, motor vehicles, etc. Capital, $20,000. Incorporators, C. W. Day, E. S. Button, T. R. Day.

Automatic Hand Truck Company, Bridgeton, N. J. Manufacture hand trucks and barrows. Capital, $25,000. Incorporators, E. M. West, H. E. Ferell, R. M. Riley.

Automatic Hand Truck Company, Bridgeton, N. J. Manufacture hand trucks and barrows. Capital, $25,000. Incorporators, E. M. West, H. E. Ferrell, R. M. Riley.

Peoples Taxicab Company, New York. Manufacture and deal in motor cars, taxicabs, etc. Capital, $200,000. Incorporators, J. M. Wittemann, E. L. Merry, T. H. Wilson.

Paragon Box Company, New York. Manufacture boxes. Capital, $10,000. Incorporators, S. Levy, 214 East Ninety-ninth street, Harry Ellis, 77 East Eightieth street, etc.

Steel Tie and Manufacturing Company, Newark, Ohio. Manufacture steel ties, rails, etc. Capital, $50,000. Incorporators, T. J. Castello, L. B. Richards, J. W. Blower, etc.

Interior Metal Manufacturing Company, Jamestown, N. Y. Manufacture metal doors, frames,etc. Capital, $150,000. Incorporators, G. Carlson, O. Eckhola, C. J. Swanson.

The Diamond Brick and Clay Company, Nelsonville, Ohio. Manufacture brick, sewer pipe, etc. Capital, $100,000. Incorporators, M. P. Ohlinger, L. H. Price, John Reuter, etc.

Chicago Jack and Supply Company, Chicago, Ill. Manufacture and deal in automobiles, etc. Capital, $14,000. Incorporators, Earle L. Robinson, A. E. V. Wright, J. M. Timmon.

Garretson Engineering Company, Buffalo, N. Y. Manufacture engines, boilers, dynamos, etc. Capital, $100,000. Incorporators, A. D. Garretson, H. D. Garretson, W. M. Hoffman.

Darwood Pump Company, Camden, N. J. Manufacture liquid-measuring pumps, bar and store fixtures, etc. Capital, $75,000. Incorporators, H. L. Darwood, W. F. Eidell, J. A. MacPeak.

Condon Specialty Manufacturing Company, Troy, N. Y. Manufacture vending machines. Capital, $50,000. Incorporators, W. R. Condon, Albany; T. J. Golden, J. Grier, Troy.

Lowerator Company, New York. Manufacture and deal in hoisting machinery, elevators, etc. Capital, $100,000. Incorporators, G. W. Younkman, A. G. Martin, H. J. Martin, Brooklyn.

Automatic Enunciator Company, Chicago, Ill. Manufacture machinery and appliances for transmitting sound. Capital, $500,000. Incorporators Sanford F. Harris, W. I. Patton, A. E. Wilson.

Cooper Spring Company, Cleveland, Ohio. Manufacture springs for vehicles and machinery for making springs. Capital, $10,000. Incorporators, W. B. Whiting, F. M. Kirby, Sterling Newell, etc.

Sterling Metal Manufacturing Company, Cincinnati, Ohio. Manufacture metal boxes and office supplies. Capital, $50,000. Incorporators, Christian Keck, Alexander Down, Harry H. Hyams, etc.

The Cuyahoga Nut and Bolt Works Company, Cleveland, Ohio. Manufacture nuts, bolts, hardware specialties. Capital, $10,000. Incorporators, Frank McHale, Fred De Eds, Anton B. Spurvey, etc.

Cleveland Elbow Company, Cleveland, Ohio. Manufacture metal stampings and sheet-metal work of all kinds. Capital, $15,000. Incorporators, Alfred R. Pearce, J. T. Pritchard, A. R. Manning, Jr., etc.

Contractors Material Supply Company, Cleveland, Ohio. Manufacture articles for use of contractors and builders. Capital, $10,000. Incorporators, Eugene E. Boalt, B. L. Turner, C. H. Stewart, etc.

Gotham Motor Car Company, New York. Manufacture motor cars, motors, engines, etc. Capital, $25,000. Incorporators, W. Schuette, R. W. Schuette, Douglas Manor, N. Y.; D. W. Gluck, New York.

Superior Rubber and Manufacturing Company, Akron, Ohio. Manufacture rubber articles and specialties, including rubber tires. Capital, $10,000. Incorporators, J. M. Hyatt, R. E. Nichol, W. J. Hollenstein, etc.

Combination Pump Valve Company, New York. Manufacture and deal in pumps, valves, etc. Capital, $10,000. Incorporators, D. F. Stayman, 528 East One Hundred and Forty-Ninth street, U. B. Leppen, 505 West One Hundred and Thirty-Sixth street, etc.

## Business Items

Arthur H. McCall has purchased and assumed management of the shop of T. R. Barendale, Allen street, Rochester, N. Y., manufacturer of punch and stamping presses, tools, dies and special machinery.

The Electric Welding Products Company has moved into its new factory addition, 94x100, three stories high, and has installed new machinery, adding very largely to its capacity in order to meet the increasing demand for its products. The number of men employed approximates 350.

The control and management of the Agnew Electric Welding Company, Detroit, has changed hands. A contingent of Cleveland men active in the management of the Electric Welding Products Company has bought out the Agnew interests. C. E. Thompson is president, J. A. Krider, vice-president, and R. K. Loofburrow, secreary and treasurer.

The first annual outing given by the Lapointe Machine Tool Company, Hudson, Mass., with its employees as guests, was observed Saturday, June 25, 1910, at Treaty Elm grove, Stow, Mass. About 150 were in attendance. Sports were indulged in, being enlivened by prizes offered by the company. The sports were interspersed with music by the Hudson band.

The Cincinnati Planer Company, Cincinnati, Ohio, reports quite an improvement in foreign business and during the present month has booked orders from Siberia, Germany, Holland, Italy, Mexico, Cuba, South America and Canada. Also booked some large orders from prominent concerns in the United States and the prospects for a big year are very good.

The Garwood Electric Company has appointed the Varney Electrical Supply Company, 235 South Meridian street, Indianapolis, Ind., its agent in the territory covering that portion of Indiana south of a line drawn east and west through Fort Wayne, except Bedford and within a radius of ten miles of Bedford; that portion of Kentucky bounded on the east by a line drawn north and south through Frankfort, and including Frankfort, and on the west by a line drawn north and south through Henderson and including Henderson. It has also appointed the Electrical Manufacturers Sales Company, of Denver, Colo., as its agent in the territory covered by Colorado, Wyoming, Utah, New Mexico and eastern half of Idaho.

## Trade Catalogs

The Industrial Instrument Company, Foxboro, Mass. Bulletin No. 36. Standard automobile gages. Illustrated.

The Rider-Bagg Company, 370 Birnie avenue, Springfield, Mass. Folder. Brass, aluminum, bronze castings, etc.

Crane Puller Company, 15 Harvard avenue, Allston, Mass. Circular. Crane's improved patent wheel puller—tool for forcing gears, flywheels, etc., on and off shafts. Illustrated.

## Forthcoming Meetings

Joint meeting of American Society of Mechanical Engineers and Institution of Mechanical Engineers, Birmingham, England, July 26-29, 1910.

Society of Automobile Engineers, convention of designers and superintendents, July 28, 29 and 30, Detroit, Mich. H. E. Coffin, president 1451 Broadway, New York City.

American Society of Mechanical Engineers; monthly meeting second Tuesday. Calvin W. Rice, secretary, 29 West Thirty-ninth street, New York City.

Boston Branch National Metal Trades Association. Monthly meeting on first Wednesday of each month, Young's hotel. D. F. P. Clark, secretary, 309 Milk street, Boston, Mass.

Providence Association of Mechanical Engineers. Monthly meeting fourth Tuesday each month. E. C. Bliss, president, 91 Sabine street, Providence, R. I.

New England Foundrymen's Association; regular meeting second Wednesday of each month, Exchange Club, Boston, Mass. Fred F. Stockwell, 205 Broadway, Cambridgeport, Mass.

Engineers' Society of Western Pennsylvania; monthly meeting third Tuesday. Elmer K. Hiles, secretary, Fulton building, Pittsburg, Penn.

Superintendents' and Foremen's Club of Cleveland; monthly meeting third Saturday. Philip Frankel, secretary, 310 New England building, Cleveland, O.

Western Society of Engineers, Chicago, Ill. Regular meeting first Wednesday evening of each month, excepting July and August. Secretary, J. H. Warder, 1735 Monadnock block, Chicago, Ill.

# WANTS

*Rate 25 cents per line for each insertion. About six words make a line. No advertisements abbreviated. Copy should be sent to reach us not later than Friday for ensuing week's issue. Answers addressed to our care will be forwarded. Applicants may specify names to which their replies are not to be forwarded, but replies will not be returned. If not forwarded, they will be destroyed without notice. No information given by us regarding any advertiser using box number. Original letters of recommendations or other papers of value should not be inclosed to unknown correspondents. Only bona-fide advertisements inserted under this heading. No advertising accepted from any agency, association or individual charging a fee for "registration," or a commission on wages of successful applicants for situations.*

## Miscellaneous Wants

Caliper catalog free. E.G.Smith, Columbia, Pa.

We buy or pay royalty for good patented machine or tool. Box 282, AMER. MACHINIST.

Machinery to order, or will purchase good patents. Interstate Machinery Co., Troy, N. Y.

Light, fine machinery to order; models and electrical work specialty. E. O. Chase, Newark, N. J.

If you want special machinery or tools designed, I can give you satisfactory service. Box 694, AMERICAN MACHINIST.

Special machinery accurately built. Screw machine or turret lathe work solicited. Robert J. Emory & Co., Newark, N. J.

Light and medium weight machinery and duplicate parts built to order; tools, jigs, etc. MacCordy Mfg. Co., Amsterdam, N. Y.

Patents. C. L. Parker, Patent Attorney, ex-examiner Patent Office, 990 G St., Washington, D. C. Write for Inventor's Handbook.

Mechanical drafting, special machinery designed, tools, dies, fixtures, etc.; charges reasonable. Box 669, AMERICAN MACHINIST.

Wanted—Work for first class machine shop; light, fine special machinery, tools, jigs and experimental work. Boyce, 584 Hudson St., New York City.

Light, fine machinery and mechanical specialties built to order; jigs, tools, etc., designed and built. Goodson Electric and Manufacturing Co., Providence, R. I.

Wanted—Machine shop to manufacture and market new labor saving machine without any competition, for royalty and some cash. Box 719, AMERICAN MACHINIST.

Does your gasolene motor run smoothly? If not, send 10c. postage for 56-page textbook on "Carbureters and Engine Troubles." Breeze Carbureter Company, Newark, N. J.

A well equipped machine shop within 30 miles from New York solicits orders for all kinds of machine work. Send inquiries: The Brunswick Refrigerating Co., New Brunswick, N. J.

A large English firm of machine-tool importers having showrooms and offices in Great Britain, France, Italy and Japan, is wanting good agencies for machine tools of all kinds. Apply Box 189, AMERICAN MACHINIST.

Wanted—A concern consisting of foundry and machine shop, employing 150 to 200 men, would like to enlarge its business by manufacturing machines for other parties; estimates given. Box 662, AMER. MACHINIST.

Oxygen-acetylene welding of all kinds of metals; crane facilities for handling the heaviest of pieces; we do light work also; our experience and success warrant us in giving a very liberal guarantee covering all of our work. Krajewski-Pesant Company, 52 Beard St., Brooklyn, N. Y.

Machine work wanted; we are in a position to manufacture special or staple articles in connection with our present line. Our facilities are such that we can employ one hundred and fifty men if necessary; our equipment also includes large case-hardening and tempering furnaces. Address H. G. Kotten Co., 30 Church St., New York City.

For Lease—A foundry thoroughly equipped for general machinery, soil pipe, iron and bronze work; complete with many patterns, flasks, two cupolas and motors, brass furnaces, etc.; located on the railroad tracks in one of the best industrial cities of the Southeast; lease $2000 per year; a splendid opportunity for the right man. Box 710, AM. M.

Machinists' and draftsmen's handbook; second edition, enlarged and revised; over 450 pages, including illustrations and tables for $2.50; from cover to cover it is full of valuable and helpful information; invaluable to the employer as well as the workman; don't send any money; simply send your order and receive the book on trust; look it over—if you like it, keep it; act today. Address Peder Lobben, Box 243, Holyoke, Mass.

Wanted—Some light work in metal manufacturing by a progressive Massachusetts company who are at present turning out a high-grade mechanical product and have been doing so for over forty years; we employ one thousand hands and have a thoroughly modern plant with uptodate machinery and facilities; we would not consider anything but a large and steady contract from thoroughly reliable parties; correspondence solicited. Address "Facilities," Box 535, AMER. MACH.

## Help Wanted

*Classification indicates present address of advertiser, nothing else.*

CANADA

Wanted—First-class toolmakers on automobile jig and fixture work; highest wages paid to first-class men; no others need apply. Reo Motor Car Co. of Canada, Ltd., St. Catharines, Ont., Canada.

Wanted—Blacksmith foreman; a large agricultural manufacturing concern now building at Hamilton, Canada, require the services of a competent forge shop foreman, preferably one with plow manufacturing experience; this position offers exceptional opportunities to the right man; to receive consideration give detailed account of your experience covering the past two years, with reference, and address Box 672, AM. MACH.

COLORADO

Due to the steady increase of our business, we are constantly in need of drill press, lathe, planer, grinder, Jones & Lamson and bench men; also toolmakers and tool smiths; good climate and location; steady work, good pay to first-class men; shop clean, light and well ventilated; 9 hours work. Address, stating experience. J. Geo. Leyner Engineering Works Co., Littleton, Colo.

CONNECTICUT

Wanted—Salesmen to handle on a generous commission basis, a well advertising and quick selling line of lathe tools; commissions given on all orders received from prescribed territory; send references with reply. Address "R. T.," AMERICAN MACHINIST.

ILLINOIS

We invite applications from first-class machinists, machine and floor men; steady work for first-class men; preference will be given married men who will move their families and stay permanently. The Ingersoll Milling Machine Co., Rockford, Ill.

Wanted—General storekeeper; a young man experienced in organizing stockrooms and arranging and classifying materials in systematic manner; we want an executive with energy and ability to handle stock keeping system and get results; fine opportunity. Address, giving age, experience in full, and wages desired. Box 699, AMER. MACHINIST.

INDIANA

Wanted—Machinists, we are continually increasing our force; we invite application from lathe and floor hands, those who desire a steady position. Apply at Wood Turret Machine Co., Brazil, Ind.

Wanted—A first-class tool and diemaker by an old established manufacturing concern located in the Middle West, one who has had experience in deep drawing and stamping tin plate specialties; steady work and good opportunity for advancement if deserved; state experience had, age, if married or single. Address "M. F. G. R.," AMERICAN MACHINIST.

MASSACHUSETTS

Wanted—Toolmakers, experienced on punch and die work. Apply Employment Department, General Electric Co., Pittsfield, Mass.

Wanted—Competent toolmaker for experimental work by Boston concern. Address, giving age, experience and other information. Box 680, AMERICAN MACHINIST.

Wanted—A thoroughly competent machine designer with inventive faculty and thorough knowledge of modern shop practice to work on special line of machinery. Apply by letter only, giving age, experience, reference and salary desired, to Room 809, 318 Main St., Springfield, Mass.

MICHIGAN

Wanted—A few first-class toolmakers experienced on die, jig and fixture work for light manufacturing. Box 592, AM. MACH.

NEW JERSEY

Wanted—First-class machinists, lathe, planer and boring mill hands. Box 709, AM. MA.

Wanted—Experienced Gisholt and Jones & Lamson lathe operator; good wages and steady work. Box 695, AMERICAN MACHINIST.

Old established machine shop, manufacturing sheet metal working machinery, wishes to receive applications from men qualified for foremanship. Address "Foreman," Box 713, AMERICAN MACHINIST.

Wanted—Assistant in engineering department; must be familiar with mechanical drawing and thoroughly accurate and rapid in calculating weights of castings, etc., for estimates. Box 702, AMERICAN MACHINIST.

NEW YORK

Wanted—A draftsman, one preferred who has experience in engine and heavy sawmill machinery. Clark Bros. Co., Belmont, N. Y.

Wanted—Foundry foreman; man who is up to date in latest and best molding machine and cupola practice. Address "C. R.," AM. M.

Wanted—A few first-class toolmakers on small accurate work; good wages and steady employment to competent men. Bundy Mfg. Co., Endicott, N. Y.

Wanted—Ambitious shop men who can talk, are tired of being subordinates and wish to become independent, write to Box 717, AMERICAN MACHINIST.

Designer wanted for tools and special machinery for small interchangeable work; state experience, age and salary expected. Box 707, AMERICAN MACHINIST.

Wanted—Thoroughly experienced time-operation and machine-study man; give fully experience and references; highest salary paid for right man. Box 704, AMER. MACHINIST.

Tool dresser, first-class men only need apply; excellent opportunity for advancement. Write, stating age, experience, wages expected, "Tools," care Allen, 45 West Thirty-Fourth St., Manhattan.

Wanted—In every manufacturing town in the East and Middle West, a live man who thoroughly understands tool steel and its uses, to write Box 716, AMERICAN MACHINIST, when he will hear of something to his advantage.

Machinist, bright, energetic and a hustler, must be able to get out orders and handle about 20 men and boys of different nationalities to advantage, where hardware specialties are made; state age, reference and full particulars; steady position. Box 705, AM. M.

Wanted in August—A strictly high grade executive factory manager who is now commanding at least $5000 per year; not over forty years of age; give full detail as to experience and references; salary secondary consideration. Box 703, AMER. MACHINIST.

Cost accountant wanted by prominent firm of public accountants, first-class man, capable of taking sole charge of devising and installing cost systems; must also be thoroughly conversant with general office accounting; permanent position; give full particulars of experience and salary required. Box 708, AMERICAN MACHINIST.

A large technical school in the East desires the services of a young man in the mechanical laboratory; a man with a technical education and some practical experience preferred; personality and intellectual ability are preferred to teaching experience; entering salary is $800 per year. Address "Y," AMERICAN MACHINIST.

Wanted—Three men who are thoroughly experienced in factory production, organization and accounting work; those who have been employed professionally on such work preferred; conference by appointment only, and after thorough investigation of references and experience. Address Clinton E. Woods, 27 East 22nd St., New York, N. Y.

Wanted—We are constantly increasing our force and invite applications from the following: Machinists, lathe hands, screw machine hands, grinder hands, milling machine hands, motor assemblers, toolmakers, sheet metal die men; we run a nine-hour shop, have desirable surroundings, and offer steady position to desirable characters. Address Superintendent, Maxwell-Briscoe Motor Co., Tarrytown, N. Y.

OHIO

Wanted—First-class toolmaker on miscellaneous tools; steady work; state age, wages and experience. Apply Long & Allstatter Co., Hamilton, Ohio.

Foreman for a machine shop tool room with a concern employing 900 men, on engine work; state age, experience and reference. Box 701, AMERICAN MACHINIST.

Wanted—Foreman to assume entire charge of brass finishing department in large manufacturing concern, making a complete line of standard brass valves. Box 671, AM. MACH.

Wanted—Five A-1 metal specialty salesmen, on large commission; no side line; only men familiar with earning from $150 to $250 per month need apply. Address the Buckley Specialty Co., St. Marys, Ohio.

Wanted—Sales manager to place on market patented electrical machine, already thoroughly tested out; to sell $500 each, to manufacturers; big available market and great development possible; give experience, references, salary now earning and age. Box 714, AMERICAN MACHINIST.

Superintendent—A business, employing 500 men, consisting of pattern, foundry and machine shop, manufacturing medium heavy machinery, desires superintendent with thorough knowledge of foundry and machine business; man must be systematic, and have held successfully position of superintendent in a modern organization; good salary and future with an expanding company; only men of ability need apply; location northern Ohio. Box 650, AMERICAN MACHINIST.

Wanted—First-class machinists, toolmakers die sinkers, lathe, planer, drill press, screw machine, boring and milling machine operators, wood patternmakers, brass molders, polishers, buffers, finishers, spinners, millwrights, hammermen and blacksmiths who are seeking positions or desirous of improving on those which they have, to register their names and addresses with the free Employment Department of the National Metal Trades Association. Address Commissioner's Office, 605 New England Bldg., Cleveland, O.

OREGON

Wanted—Competent machinists (strictly non-union) may secure steady work at wages from $3.50 up to $4.50 for 9-hour day; high grade work with modern tools in a comfortable, well lighted shop located in the finest country in the United States. Willamette Iron & Steel Works, Portland, Ore.

PENNSYLVANIA

Wanted—Floor hands and fitters on machine tool work. Colburn Machine Tool Co., Franklin, Penn.

Wanted—Inspector for automobile forging plant. Western Tool & Forge Co., Brackenridge, Pa., Pittsburg district.

Wanted—Lathe, boring mill and floor hands; good wages, steady work. The Blaisdell Machinery Company, Bradford, Pa.

Machinists — Machine operators wanted; plenty of work, nothing but sober and steady men need apply. Standard Engineering Company, Ellwood City, Pa.

Steel Salesmen—We want several general steel salesmen of experience and ability; experienced in high-speed steel, alloy and crucible carbon steels; this opportunity is a most excellent one for the right men, who are qualified in every respect to become high-grade sales managers. Address "V. A. S.," AMERICAN MACHINIST.

The Monotype School is maintained to train young men to meet the constant demand for operators of our type casting and composing machine; these operators do so well that we receive more applications for places than can be filled; these qualifications carry most weight: Common sense, automatic machinery experience, printing office experience, type foundry experience. Full particulars will be furnished to inquirers who furnish the same information about themselves, and mention this paper. Lanston Monotype Machine Co., Philadelphia.

RHODE ISLAND

Wanted—Ten draftsmen and designers; must be experienced and practical, capable of designing jigs, fixtures and punches and dies for the economical manufacture of automobile engine parts, also interchangeable parts for small automatic machines. The Taft-Peirce Manufacturing Co., Woonsocket, R. I.

WISCONSIN

A machinery salesman wanted; a fine position with large possibilities for the right man; in your reply state length of selling experience, class of machinery handled and names of references. Box 698, AM. MACH.

Shop man who understands the rapid and accurate production of small, interchangeable parts, and who has a good knowledge of production of stampings; must be sober, energetic and good mechanic; state age, experience, salary expected, where employed at present, and reasons for desiring a change. "X. Y. Z.," AMERICAN MACHINIST.

## SITUATIONS WANTED

*Classification indicates present address of advertiser, nothing else.*

CANADA

Wanted—A few agencies for Canada or the Province of Quebec by a salesman, fifteen years' experience in pumps, boilers, engines and machinery; would confine himself to one line. Box 346, AMERICAN MACHINIST.

ILLINOIS

Experienced, practical, systematic, superintendent in charge of a large manufacturing plant, wishes to make a change. Box 686, AMERICAN MACHINIST.

NEW JERSEY

Tool designer wishes change; all-around toolmaker and draftsman, technical training; charge of tool work or master mechanic. Box 718, AMERICAN MACHINIST.

NEW YORK

Designer, experienced on automatic and special machinery, capable of taking charge of work. Box 721, AMERICAN MACHINIST.

Tool and die or machinist foreman; executive, reliable, practical; New York City vicinity; interview. Box 720, AMER. MACH.

First-class mechanical draftsman, technical education, designer of Corliss and high-speed engines, pumps, etc., wishes position. Box 697, AMERICAN MACHINIST.

Designer, graduate, 2 years shop, 12 years office; exceptionally competent on special and automatic machinery, typewriters, adders and fine experimental work. Box 681, AM. M.

General foreman, middle age, now employed, latest methods, engineering, electrical and general machinery; A-1 hustler; can handle force with executive ability. Box 715, AMERICAN MACHINIST.

Expert on hardening and tempering all kinds of tool steel, high speed steel and case-hardening, 15 years' experience, wishes position; can furnish best recommendation. Box 673, AMERICAN MACHINIST.

Position as draftsman or designer wanted by technical graduate with one year's shop practice and 4½ years' drawing room experience on general machine work; good checker and accustomed to taking care of work. Box 682, AMERICAN MACHINIST.

OHIO

Experienced superintendent, now employed, is open for change; expert on light and medium machinery, automobile work and sheet metal stamping; drafting room experience, and all-around factory man; American, strictly sober, honest and industrious; location, northern Ohio. Box 683, AMER. MACH.

PENNSYLVANIA

I am a machinist and want a job. Box 687, AMERICAN MACHINIST.

A superintendent, tool and machine designer who is an A-1 mechanic, desires a position in any of above lines. Box 696, AM. M.

Experienced draftsman on automatic machinery and tools for interchangeable parts, desires a position. Box 711, AMER. MACH.

Wood patternmaker foreman, at present has charge of large job manufacturing shop, desires change; can estimate work and have executive ability. Box 712, AMER. MACH.

Mechanical engineer, sixteen years' experience as works engineer and expert for concern employing 700 men, desires position as engineer or superintendent; good systematizer and well up in modern methods. Box 693, AMERICAN MACHINIST.

Mechanical engineer, college graduate, with three years' workshop training and seven years' experience in steam engines and air compressors, at present employed with ice machine company, desires responsible position, preferably with air compressor company. Box 706, AMERICAN MACHINIST.

WISCONSIN

Bright young man, aged 26, desires position as tool designer on small tools; 10 years' experience in shop and at the board; would like to communicate with some reliable firm. Box 700, AMERICAN MACHINIST.

## FOR SALE

For Sale—McIntosh-Seymour vertical cross-compound non-condensing engine; cylinders 16" and 28" with stroke 24"; direct connected to Stanley three-phase alternator, inductor type, 440 volts, 60 cycle; we have been taking 500 horsepower from it. The Davis Sewing Machine Co., Dayton, Ohio.

For Sale—Three return tubular boilers, manufactured by Riter Bros., Buffalo, N. Y. Drums 72x16 feet 0 inches; each boiler with sixty-six 4-inch tubes; inspected by Travelers Indemnity Company, of Hartford, Conn; 93 lb. steam pressure; boilers in good condition; can be delivered in two to three months, and seen in operation at Buffalo Bolt Company's plant, North Tonawanda, N. Y.

For Sale—One Nash gas engine, 20 horsepower, two cylinder, for electric lighting, pumping or power; one Beaman & Smith horizontal boring mill; table 25 inches wide, 36 inches long; will bore 12 inches diameter, 24 inches long, and face 20 inches diameter; one 300 light J. B. Colt Co. acetylene gas apparatus. The above machines are in excellent condition, having been very little used. For further particulars and prices apply to Rider-Ericsson Engine Co., 35 Warren St., New York.

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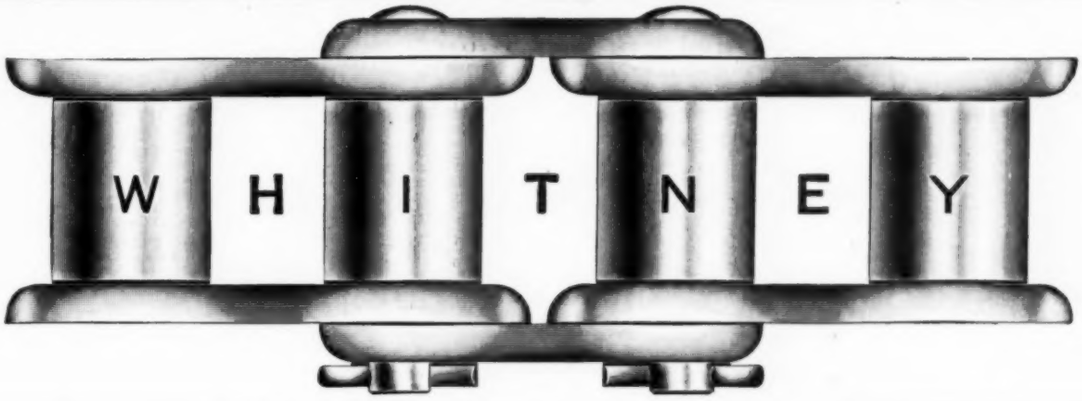
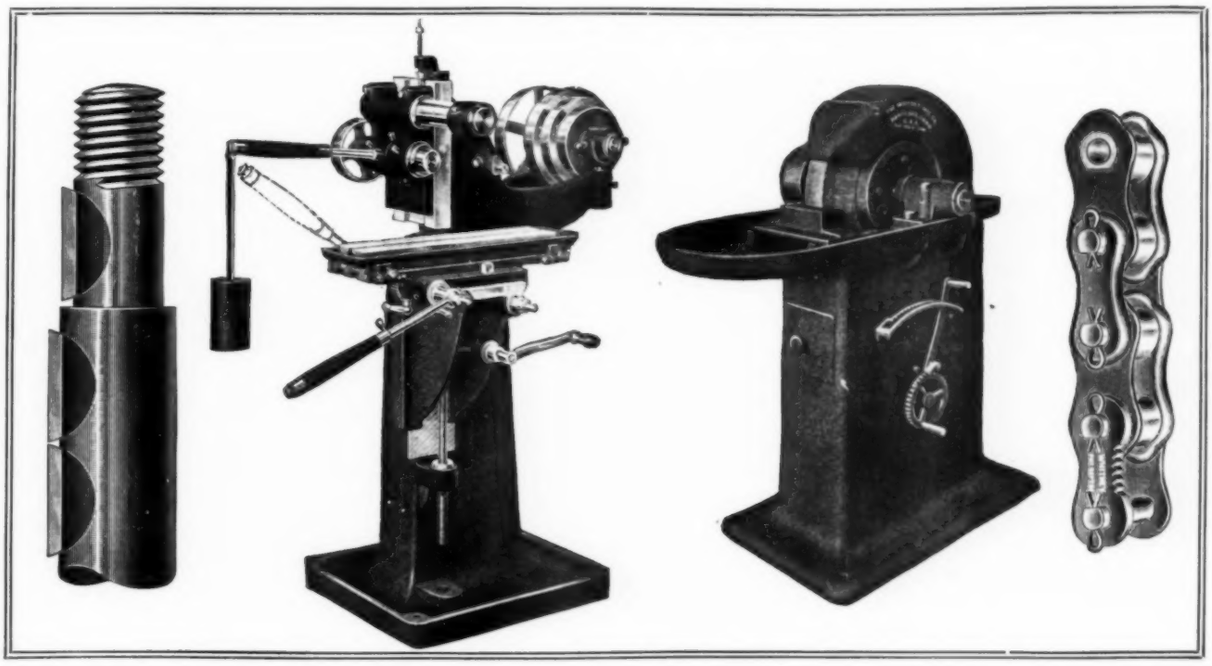



# Chain Department

**Roller Chains, Block Chains, Chain Belts, Quiet Chains, for Automobiles, Commercial Cars, Motorcycles, Bicycles, Machinery, etc.**

# Machine Department

**Hand (feed) Milling Machines, 20-inch Water Tool Grinders, Keys and Cutters for the Woodruff Patent System of Keying, Presto Drill Chucks, Collets and Friction Tapping Devices.**



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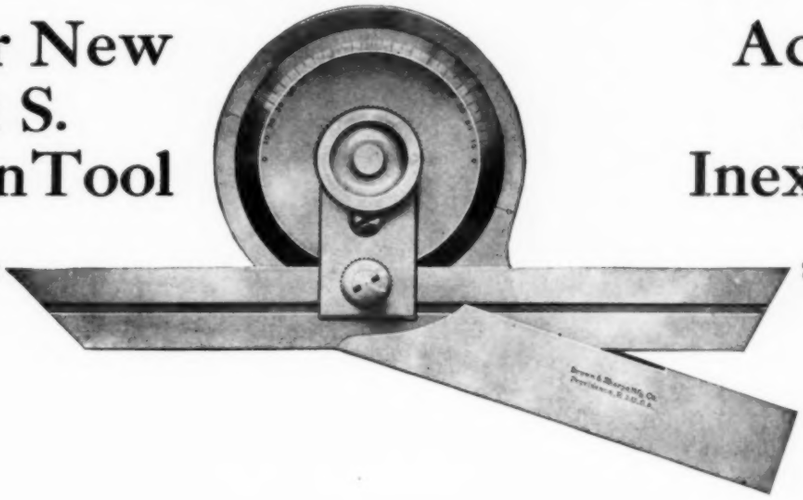
# Another New B. & S. Precision Tool



# Accurate And Inexpensive

## For Laying Out Or Establishing Angles

# B. & S. Improved Bevel Protractor

## For Mechanics and Draftsmen.

This protractor is the latest addition to the B. & S. line of tools of precision. It is intended primarily for the use of mechanics and draftsmen who desire a tool to use in laying-out or establishing angles, whose work does not require a vernier. It is similar in design to the Universal Bevel Protractor, Nos. 495 and 496, which have the vernier.

One side of the protractor is left flat and this permits the tool to lie flat on the work or paper, a feature the value of which will be instantly apparent to the users of the instrument.

The dial is graduated to degrees, the graduations reading 0 to 90° from each extremity of an arc of 180°. The dial turns on a large central stud, which is hardened to provide against any possibility of wear. After the dial is once set it can be rigidly clamped in place and thus preserve the setting.

The blade of the protractor can be moved back and forth its entire length and can be clamped independently of the dial. This adapts the protractor to work that cannot be handled by other protractors. The grooves and corners in the tool are made with rounded corners that do not collect dirt, thus aiding the accuracy.

**Send for circular, just issued.**

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# The Things Which Make Landis Grinders Superior To All Others

## Common To All Landis Grinders

THE fixed weight, the grinding wheel carriage, moves—the advantages of this principle are: unvaried duty imposed at all times upon the carriage-driving mechanism insuring accuracy of traveling distance between points of reversal; uniform and positive lubrication of the ways; a rigid and stationary foundation for the work whatever its length or weight; no overhanging of the work table, it being supported its entire length by the main column of the machine to which it is firmly clamped—thus avoiding vibration—a feature which is so essential to rapid and accurate grinding.

The head- and tailstocks are clamped against a surface along the front edge of the table which is thoroughly protected against dirt and grit, insuring alignment of centers when positions of heads are changed.

No surfaces upon which alignments are dependent are exposed to dirt or grit while grinding.

The surfaces of the table to which the heads are clamped as well as the wheel carriage guide ways are chilled, assuring the maximum durability and preserving of alignments.

The guide ways are entirely covered in whatever position the carriage may be.

The grinding wheel spindle is made of special analysis steel, hardened and accurately finished by grinding.

The wheel spindle bearings are made of phosphor bronze, are self-aligning and have taper adjustments for wear.

Grinding wheel collars or centers have provision for balancing wheels which is done by shifting weights in an annular groove; this feature is not found in any other make of grinding machines.

All operating levers, handles and adjustments are within easy reach of the operator from the front of the machine.

The grinding wheel is always in plain view of the operator when making any speed change or adjustment.

All speed changes can be made without stopping either the work, the traverse or the wheel.

The water tank is separated from the machine, is easily accessible for cleaning and holds an ample supply of water.

The pump requires no priming, packing or adjustment and the bearings do not come in contact with the water.

The work is revolved by powerful variable speed gearing.

The work driving face-plate bearing is of large proportions and thoroughly protected against water and grit.

Work-driving pin on face-plate can be used at any radius up to limit of swing.

All gearing of the machine is fully enclosed and absolutely dirt and grit proof.

The grinding wheel tarries at points of reversal for grinding clean at shoulders and the period of tarry can be regulated to suit the work speed.

The carriage ways are oiled by rolls in pockets and all surplus oil delivered to the ways returns to the pockets.

Steady rests support the work both underneath and in front, and have independent horizontal and vertical adjustment.

The grinding wheel can be dressed in any position of its travel without removing the work.

The diamond holder can be clamped anywhere along the table and need not be removed while grinding.

The table has scales for grinding taper which are graduated in both degrees and inches per foot (taper in millimeter per meter can be furnished when desired).

The water spout is arranged with universal adjustments and can be set to direct stream to any point, and to be instantly moved out of the way for examination of work or change of wheel.

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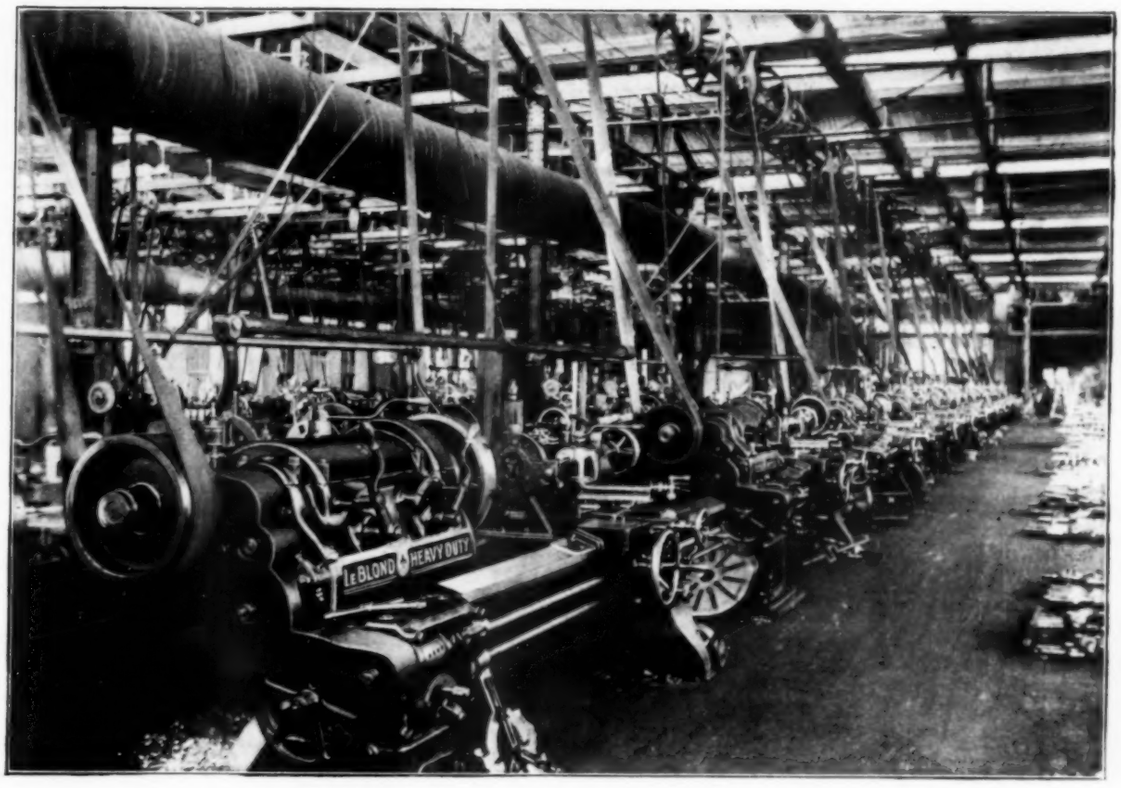


# Lathe Costs

The reduction of lathe cost has been the stock argument of lathe manufacturers for so many years that it is getting threadbare.

This is not the old story, but a bit of evidence submitted for your consideration.

The installation of thirty LeBlond Heavy Duty Lathes shown above is in the crank shaft department of one of the largest manufacturers of automobile parts.

The equipment was purchased after a series of competitive tests had proven to this manufacturer that they were the greatest producers in the lathe field.

Another large manufacturer of Automobiles writes us that he is turning the pins on seventy-five four-throw cranks per day of ten hours.

You may not be interested in the manufacture of Auto parts, but the results stated are certainly indicative of what can be done on your own lathe operations.

We do not ask you to buy these lathes on the statements of a few of our customers, but will prove to you in your own plant and on your own work that these Heavy Duty Lathes will reduce your costs.

## The R. K. LeBlond Machine Tool Co.

### Cincinnati, Ohio.

DOMESTIC AGENTS—Niles-Bement-Pond Co., Birmingham, Boston, Chicago, New York, Philadelphia, Pittsburg; W. M. Pattison Supply Co., Cleveland, Ohio; J. L. Osgood, Buffalo; F. E. Satterlee Co., Minneapolis; J. W. Wright & Co., St. Louis; E. A. Kinsey Co., Cincinnati; C. C. Wormer Mchy. Co., Detroit; Caldwell Bros. Co., Seattle, Wash.; Portland Mchy. Co., Portland, Ore.; Hendrie & Bolthoff Manufacturing and Supply Co., Denver, Colo.; Eccles & Smith Co., San Francisco; Smith-Booth-Usher Co., Los Angeles, Cal.
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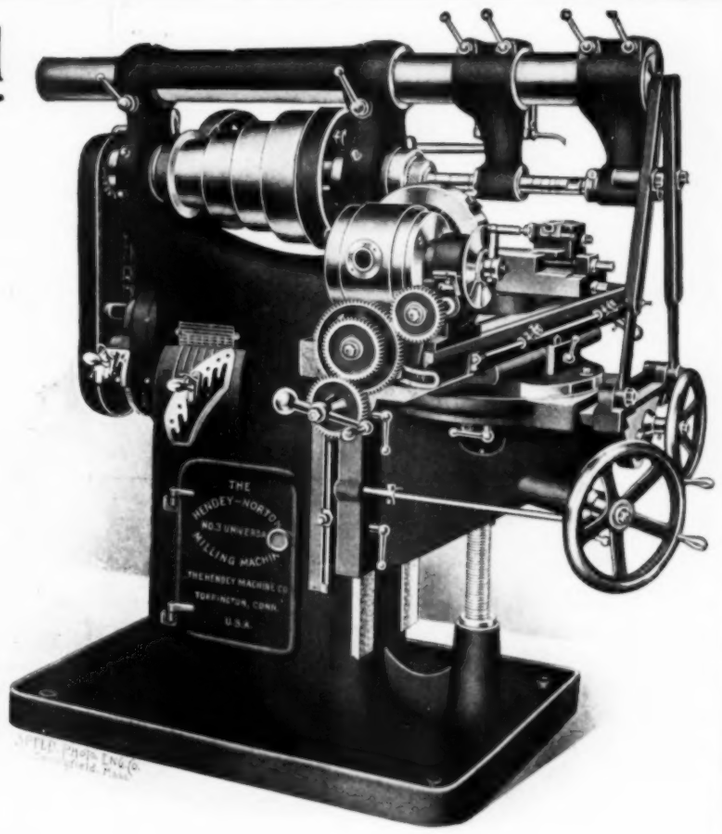
# No. 3 Universal Miller




FEEDS 30x10x19" all automatic, with positive roller chain drive. Working surface of table, 48¾"x11". Main spindle has taper journals running in annular bearings fitted with ring oilers. Knee rigidly braced and has projected bearing on column of machine. Elevating screws telescopic. Table feed screw fitted with ball bearing thrust. Dividing head spindle travels through an arc of 216 degrees. Head has tool steel worm running in oil bath. Is tested for accuracy in divisions on an 8" diameter plate. All feeds and reverse of same within easy control from front of knee.

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**Torrington, Conn., U. S. A.**

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The Automatic Threading Lathe easily saves 25 to 75% in labor because one man can conveniently operate several machines. Its double tool post allows the use of 2 tools at once, one working on each side of the same thread and only the regular lathe tools are used. The capacity is, external threads up to 12"—internal threads up to 20" in diameter, from 13 threads per inch to one thread in 8".

Send samples or blueprints of your work for production estimates.

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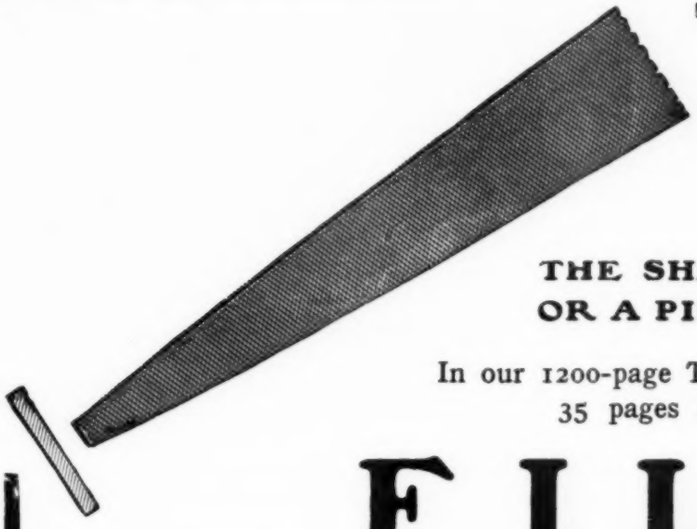

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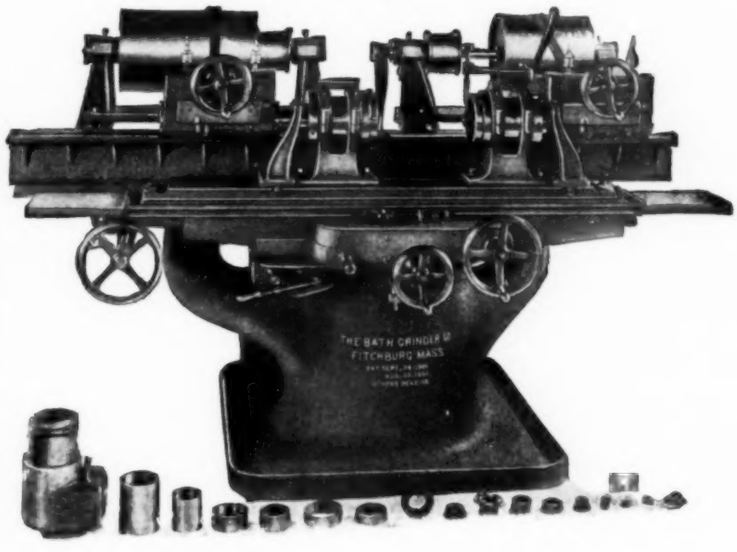

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